COMPETITION MANUAL

2026

SCOUT

2026 MATE ROV COMPETITION:

Pushing Performance: Science, Technology, & Discovery in Harsh Environments

SCOUT CLASS COMPETITION MANUAL

For general competition information, including a description of the different competition classes and eligibility requirements, visit Compete.

Contents

OVERVIEW

From Technical Talents to Teamwork, Problem-Solving, Creativity, and Critical Thinking: MATE Develops Skills for Success in the Workforce.

As you prepare to develop and deploy technologies to monitor ocean conditions and understand ecosystems, make sure to find a moment to reflect on the skills that you are developing to allow you to tackle these tasks. These are the skills that you will take with you along your educational journey and pathway into the workplace.

They also happen to be the skills that are in high demand by employers around the globe. Machine learning, data analytics, AI, video marketing, critical thinking, creativity, collaboration, time management, and leadership – articles published by LinkedIn and Forbes Magazine highlight these technical and employability (aka "Soft") skills as the most "in-demand for the next 10 years" and, likely, beyond.

A number of these skills could be described as "entrepreneurial," part of a skill set that also includes the ability to understand the breadth of business operations (from using data to make informed financial decisions to researching and critiquing potential design solutions and producing content for media outreach); acknowledge your strengths (and weaknesses!); work as an integral part of a team; and apply technical knowledge and skills in new and creative ways. By developing a business acumen, a mindset for innovation and collaboration, and an understanding of how to take environmental, social, and governance (ESG) factors into consideration when making business

decisions, you will be well prepared for the global workplace and ready to tackle today's (and tomorrow's!) challenges.

As you read through this manual you will see the following icons:*

These icons correspond to the employability (orange) and ROV-specific (green) knowledge and skills that you gain as you build your ROV and prepare for the competition and which of the various competition requirements – from Product Demonstration to Engineering and Communication – help to develop each of these skills.

**These icons are from* Evaluate-Compete*, which is designed to help give you a competitive edge in preparing for the competition and the workforce! High school and college teams are invited to participate in the projects pilot testing phase. Visit Evaluate-Compete for more information.*

THINK OF YOURSELVES AS ENTREPRENEURS

The MATE ROV Competition not only encourages you to reflect on the skills that you develop, but for more than a decade has also challenged you to think of yourself as an entrepreneur, embrace the skills that being one requires, and transform and organize your team into a start-up company. Use the following questions as a guide to assist you with this process:

- What is your company name?
- Who are its leaders, including the:
    - CEO (chief executive officer – the leader)
    - CFO (chief financial officer who oversees the budget and spending)
- Who manages Government and Regulatory Affairs (i.e. who's in charge of reviewing the competition rules and making sure that they are understood and followed by everyone)?
- Who is responsible for research and development (aka R&D)?
- Who is responsible for system(s) engineering? Design integration? Testing? Operations?
- Who is responsible for fund-raising, marketing, and media outreach?
- Who is the company's ESG research and engagement analyst?
- What other positions might you need? (Depending on your personnel resources, more than one person may fill more than one role.)
- What products and services do you provide?
- Beyond MATE, who are your potential clients?

MATE ROV COMPETITION PHILOSOPHY

In short, the MATE ROV Competition's philosophy is about **student learning**. It is student-centric and student-driven. It is about the knowledge and skills gained through participating in the competition and what you're learned prepares you for your future career in the ocean STEM workforce – and beyond.

The 2026 MATE ROV Competition continues to embody this philosophy as well as MATE's tradition of engaging and empowering participants to do "good for good" for our planet and global community. And with that, you are presented with a request for proposals (RFP), the specifics of which are included below.

PART 1: PRODUCT DEMONSTRATION

OVERVIEW

SCOUT class companies will take part in ONE product demonstration that consists of three distinct tasks:

TASK #1: ***Seabed 2023: A Kaleidoscope of Corals in Cold Water***
TASK #2: ***SmartAtlantic Alliance: Better Information, Better Decisions***
TASK #3: ***Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs***
TASK #4: ***MATE Floats Under the Ice***

NOTE: Regional competitions may not include all 4 tasks of the product demonstration; regional competitions may also give companies more than one attempt at the product demonstration. Contact your regional coordinator or visit your regional contest's website to determine what will take place at your regional competition. Regardless, the product demonstration score will be added to your ENGINEERING & COMMUNICATION and SAFETY scores to determine your total, overall score for the competition.

SCORING OVERVIEW

The competition consists of product demonstrations, engineering and communication, and safety with the following scoring breakdown:

- **Product demonstrations**
    - 200 points (max), plus a time bonus

- **Engineering & Communication**
    - Technical documentation - 50 points (max)
    - Engineering presentations - 50 points (max)
    - Marketing displays - 50 points (max)
    - Company Spec Sheet - 20 points (max)
    - Corporate Responsibility - 20 points (max)
- **Safety**
    - Safety Inspection - 10 points (max)

TOTAL POINTS = 400

NOTE: Regional contests may not require all of the Engineering & Communications components or offer the opportunity to earn points for Corporate Responsibility. Contact your regional coordinator or visit your regional contest's website for more information.

TIME

The time that your company will have to complete the product demonstration will depend on your regional event. In general, the product demonstration time consists of a 3-minute set-up period, a 10-minute performance period, and a 2-minute demobilization period. Contact your regional coordinator or visit your regional contest's website to determine how your demonstration will be timed and how long you will have to set up, complete the tasks, demobilize, and exit the station.

At any time during the demonstration, you may pilot your ROV to the surface and remove the vehicle from the water for such things as buoyancy adjustments, payload changes, and troubleshooting, but the 10-minute product demonstration clock will only stop if a judge determines it is necessary for reasons beyond your control. Otherwise, the clock will only stop after all of the tasks are successfully completed and the ROV has been piloted to the surface, side of the pool and is withing the grasp of a company member. Your ROV is not required to return to the surface between tasks.

TIME BONUS

Companies will receive a time bonus for each product demonstration if you:

1) successfully complete all the tasks,
2) return your ROV to the surface under its own power so that it touches the side of the pool, and
3) physically touch your vehicle before the demonstration time ends.

How the time bonus is calculated will depend on your regional event. Contact your regional coordinator for more information.

CONTEXT & NEED

What's in store for the 2026 MATE ROV Competition season? Interesting (and challenging!) mission scenarios, including a first-time ever operating environment and technology-integration task for teams advancing to the World Championship. But we're getting ahead of ourselves!

This season, alongside the Decade of Ocean Science for Sustainable Development (2021-2030), the MATE ROV Competition is highlighting priorities of the Decade of Action for Cryospheric Sciences (2025-2034). Endorsed by the United Nations, the Decade of Action for Cryospheric Sciences is a global effort to boost research, strengthen international collaboration, drive action, and raise awareness about the vital role of Earth's frozen regions. The initiative calls on scientists, technologists, governments, and communities worldwide to unite to protect the cryosphere and safeguard the billions of people who depend on it for their livelihoods and survival.

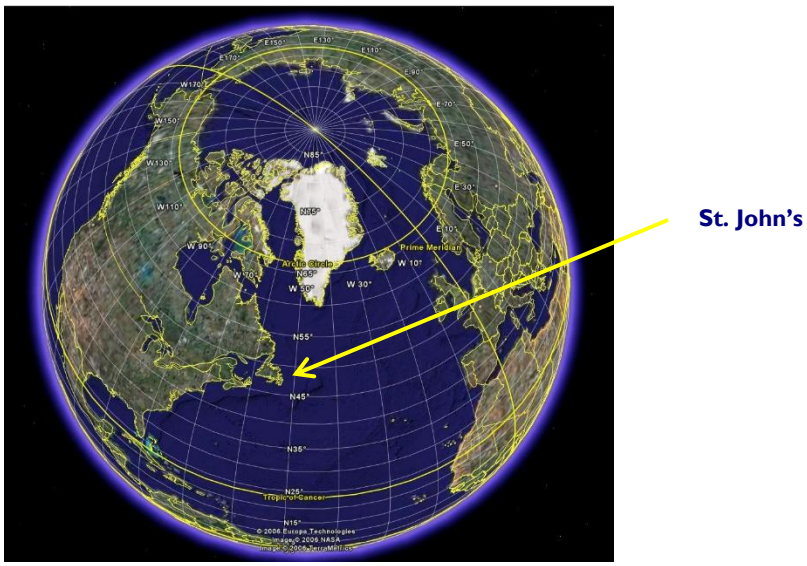
The cryosphere includes polar ice sheets and sea ice, mountain glaciers, snowpacks, ice on lakes and rivers, and permafrost (soils that stay below 0°C for years). Although it may seem remote, the cryosphere covers a huge area, around 10% of the Earth's land, and stores most of the planet's freshwater. About 70% of the world's fresh water is locked up in the cryosphere. This means most river water and drinking water ultimately come from snow and ice melt.

The UN resolution that established the Decade of Action for Cryospheric Sciences calls on us to achieve the following 4 goals to deepen our understanding of cryospheric changes and develop solutions:

- Advance scientific research and monitoring
- Raise awareness
- Support adaptation
- Build on global initiatives, like the Decade of Ocean Science for Sustainable Development

If we are to attempt to achieve these goals, we'll need technologies capable of performing in cold, icy, harsh environments – and facilities in which to test them.

It seems quite fitting, then, that the 2026 MATE World Championship is taking place in the city of St. John's. Located ~2,100 km south of the Arctic Circle, St. John's is the capital of the province of Newfoundland and Labrador, Canada, on the "Eastern Edge" of North America. The oldest city in North America, St. John's offers old-world charm, unique architectural, historic and natural attractions, and is located in close proximity to spectacular coastlines, historic villages, and a diverse selection of wildlife.



Even more relevant for the 2026 season, the city is also home to Marine Institute (MI) of Memorial University of Newfoundland and the National Research Council Canada's (NRC) world-class facilities. MI houses the world's largest flume tank, with a water capacity of 1.7 million liters and water velocity ranging from 0–1 meters per second. The flume tank's viewing gallery has a 20 meter-by-3 meter viewing window and seats 150 people. The NRC includes an ice tank and offshore engineering basin. In the ice tank, the water surface can be frozen, and the air temperature maintained at a uniform –30 to 15 degrees Celsius to simulate the polar environment. The offshore engineering basin is used to simulate the extreme ocean environment; waves, wind, and currents can be controlled to achieve various sea states.

The ability to simulate harsh, extreme conditions in a controlled environment not only makes these facilities unique, but is also sought after by organizations, institutions, and corporations from around the world that understand the need to push the performance of their technologies before deploying them in the real world. Scientists, engineers, and technicians use the facilities at the MI and NRC to demonstrate and test the vehicles, instrumentation, and equipment that supports their research, data collection, mapping, exploration, and energy operations to prove their real-world readiness because "if it works here, it will work anywhere."

This year, those teams that advance to the MATE World Championship will have access to these facilities and that same opportunity to push the performance of their technologies. (As they say at The Launch, MI's state-of-the-art marine base in Holyrood, NL, "[it's] as real as it gets.") While not staged in an ice tank, offshore engineering basin, or flume tank, the 2026 mission tasks will be equally as unique and challenging at MATE regional events, where ROVs and vertical floats will be pushed to perform in new and innovative ways.

While the specific mission tasks (including the first-ever staged in saltwater debuting at the MATE World Championship 😉) may come as a surprise, the following sentence should not. This competition season, MATE's 24th, the "client" is us: our global community of learners, inspired by the ocean, innovating and collaborating to address environmental and societal challenges.

This year the MATE ROV Competition is challenging its community to design and build a remotely operated vehicle and the necessary sensors, tooling, and complementary technologies to tackle mission tasks that include demonstrating the efficacy of offshore wind turbines in powering offshore oil rigs; mapping the seabed and documenting discoveries; deploying instrumentation and monitoring the health of cold-water habitats; and operating equipment under the ice. Equipped with scientific data (and discoveries!) and technology solutions, and with an understanding of the actions that we need to take, we can proactively and confidently move from the ocean – and cryosphere – we have to the ocean, fluid and frozen, that we want.

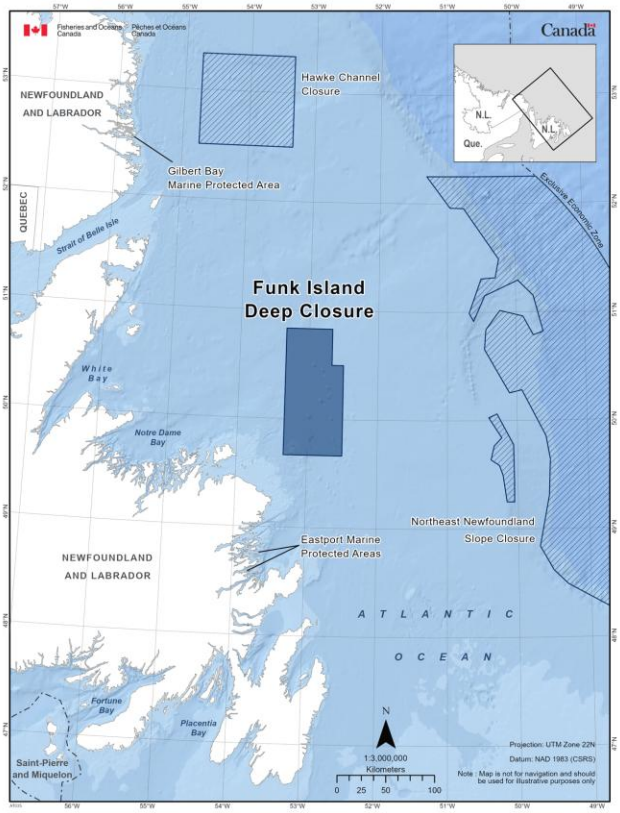
It should also come as no surprise that our success depends on an appropriately educated and skilled workforce, one that is aware of and informed about the challenges we face and prepared to apply its knowledge and skills to tackling them.

REQUEST FOR PROPOSALS (RFP)

1. General
    a. Overarching:
        Ocean Decade Challenges for collective impact:
            #9: Skills, knowledge, and technology for all
            #10: Skills, knowledge, technology and participation for all
        Decade of Action for Cryospheric Science Goals
            Advance scientific research and monitoring
            Raise awareness
            Support adaptation
            Build on global initiatives

    b. Mission Task 1: *Seabed 2023: A Kaleidoscope of Corals in Cold Water*
        Ocean Decade Challenges for collective impact:
            #2: Protect and restore ecosystems and biodiversity
            #8: Create a digital representation of the ocean

In addition to hosting the 2026 MATE World Championship, the Marine Institute of Memorial University leads research and student training cruises in the waters around Newfoundland and Labrador. On a recent expedition to the Funk Island Deep marine refuge, located off the northeast coast of Newfoundland, researchers discovered an amazing (and rare) site – a densely populated soft coral garden on the seafloor.



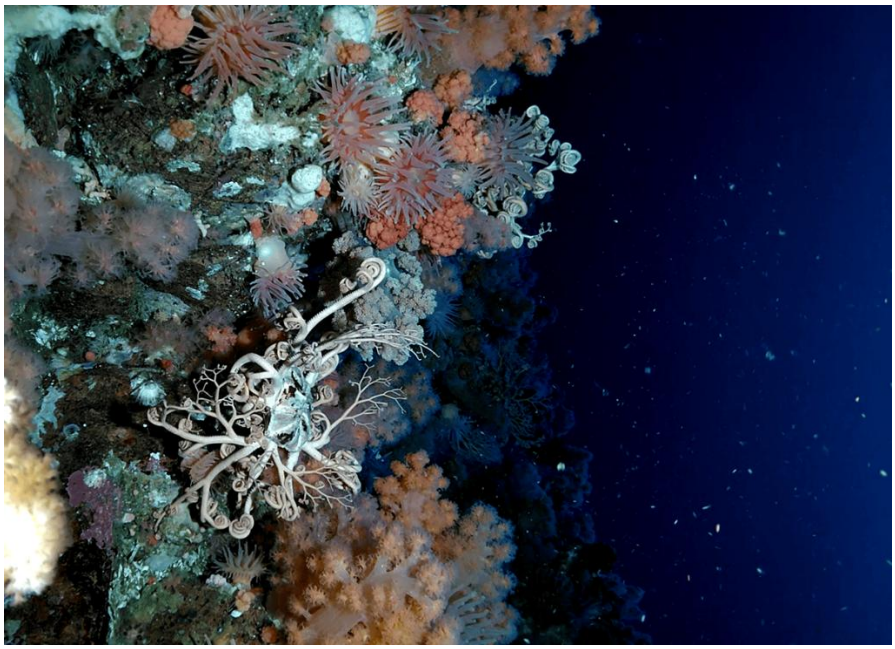
A map of the Funk Island Deep Marine Refuge. Funk Island Deep Closure.

Less familiar than the hard corals of warm-water coral reefs, cold-water soft corals are found worldwide in all oceans, from the tropics to the polar regions, typically in the deep sea where temperatures are cold. They can be found from a few meters deep to over 6,000 meters and are often on underwater mountains, seamounts, and continental slopes.

Soft-bodied coral species seen in the video from the Funk Island Deep are known to be abundant in the northwest Atlantic, but what made this sighting so extraordinary was both the density and the extent of the corals. Researchers estimate the area of the coral garden to be around 10,000 square meters. What was also surprising was the shallow depth; finding dense concentrations of corals at depths of less than 200 meters is rare.

The corals are so densely packed that researchers are unable to see the seafloor. Rare Coral Habitat Discovered using Rayfin Camera — SubC Imaging.

Using the video footage, researchers were able to identify at least two different species of coral, along with other marine life, such as sponges, basket stars, anemones, crabs, arthropods, and fish. This is the first time such a habitat has been documented in these waters. It also opens the potential for other, equally unique and surprising, discoveries to be made as scientists, engineers, and technicians continue to survey and map the seafloor.



Cold water soft corals found in the Funk Island Deep marine refuge. Rare Coral Habitat Discovered using Rayfin Camera — SubC Imaging.

Finding the coral garden in the Funk Island Deep is only the beginning; researchers at the Marine Institute are eager to study and understand it, including the number of coral species present, their interaction with the substrate, and their relationship with the other species in the ecosystem. And,

as part of the Institute's 4D Oceans Lab mission, they are also interested in further photographing, videoing, and mapping it; while the ocean contributes considerably to Canada's economy, less than 10% has been adequately mapped and the spatial distribution of most species is not well understood.

And while the strong currents that sweep over and around the ridge where the corals are located can make studying and monitoring the ecosystem challenging, the Marine Institute has the ideal training facility for operating in a current. The Marine Institute's Flume Tank, the world's largest, offers coral garden researchers the opportunity to practice maneuvering and maintaining position in a simulated environment, supporting their work to understand this kaleidoscope of coral colors in the cold ocean.

The Flume Tank. Photo from Marine Institute.

c. Mission Task #2: *SmartAtlantic Alliance: Better Information, Better Decisions*
Ocean Decade Challenges for collective impact:
#2: Protect and restore ecosystems and biodiversity
#7: Expand the Global Ocean Observing System

The SmartAtlantic Alliance is a program coordinated by the Marine Institute of Memorial University of Newfoundland's Centre for Applied Ocean Technology and the Centre for Ocean Ventures and Entrepreneurship (COVE) of Halifax, Nova Scotia. The Alliance supports operations, awareness, and safety in the marine environment; its buoy data, weather forecasts, and information products are part of the country's coastal and ocean management efforts and are available for free to the public via its website.

Part of the SmartAtlantic Alliance, the Holyrood Subsea Observatory was installed in February 2021 to provide real-time monitoring of the ocean and marine life in Conception Bay. Located approximately four kilometers north of the Marine Institute's Holyrood Marine Base (also known as The Launch), the observatory is located in water depths of 85 meters and sends real-time data to the marine base via a fiber-optic cable on the seafloor. The observatory is expandable and will also

act as a development, testing, and demonstration facility for subsea instruments intended for harsh environment operation.

The Launch in Holyrood

One such instrument is an eDNA sensor. eDNA technology allows for the detection and monitoring of species using DNA fragments shed by organisms in the water column. It involves collecting and processing water samples (and not organisms!) to sequence for DNA. This makes it a non-invasive, cost-effective, and complete approach to determining the presence of species in ocean ecosystems. eDNA is a powerful tool for cataloging biodiversity; combining it with video, images, and data will help to paint a more accurate picture of the environment and ecosystem.

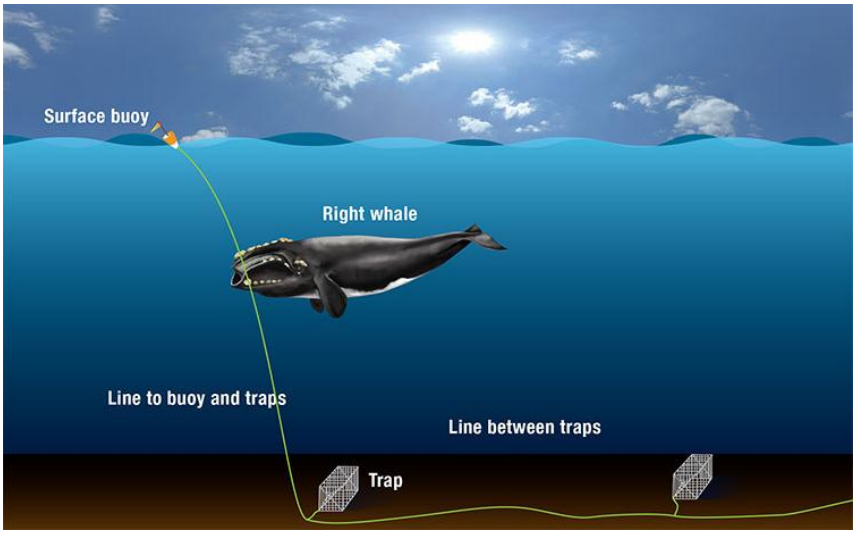
An eDNA sensor. Detecting fish with the innovative Fish Sensing Box

The camera currently installed on the Holyrood Subsea Observatory also serves as a powerful tool for cataloging organisms. The camera transmits live video feed to the marine base for five minutes every hour. The video is used to identify organisms and determine their frequency, which gives an

estimate on patterns and trends of diversity within the habitat and can be used to confirm eDNA data – and vice versa.

While the Holyrood Subsea Observatory has played an important role in detecting and identifying marine life, there is one species of interest that, because it lives in shallow depth, has escaped detection. Native to central Europe, the European green crab, *Carcinus maenas*, is an invasive species in North America. In 2007, it was found in the waters of Newfoundland and Labrador. The crab is naturally aggressive, consumes many native shellfish and finfish, and can damage sensitive eelgrass habitats. There is work being done to stop their spread. This includes physically removing crabs from the environment – without mistakenly removing look-alike native crab species.

Better information, better decisions – that is where new technology can help, and that is certainly the case with the North Atlantic Right Whale. These whales are classified as critically endangered, with the population estimated at less than 400 individuals, including less than 80 breeding females. One of the challenges faced by the Northern Right Whales is entanglement with fishing gear, particularly the lines used in lobster traps common in the area. Scientists and engineers have developed and are working with companies to field-test on-demand (also known as ropeless or buoyless) fishing technology. One system replaces the vertical line in the water column with a coiled rope and buoy stowed on the bottom in a weighted cage on the lobster trap. Fishers send an acoustic signal, which releases the buoy to the surface where it can be recovered and hauled into their boats, increasing reliability and efficiency and all the while reducing the risk of entanglement for the whale and other marine species.



North Atlantic Right Whale | NOAA Fisheries

How to avoid colliding with an iceberg is another instance where better information is helping to make better decisions. Icebergs are common in Newfoundland and Labrador waters and, while awe-inspiring when seen from the deck of a tour boat, can pose a threat to offshore structures, including oil platforms and their subsea assets and infrastructure. St. John's is a hub for the

province's offshore petroleum industry, with four major offshore oil platforms, Hebron, Hibernia, Terra Nova and Sea Rose, within 350 km of the city. A collision with an iceberg could be disastrous, damaging the structure, endangering the lives of personnel, and potentially threatening the environment, especially since roughly 90% of an iceberg's mass is underwater. Iceberg avoidance is an important consideration for platform operators, which makes the monitoring instrumentation and data products like those provided by the SmartAtlantic Alliance all the more critical for efficiency, awareness, and safety in the marine environment.


Left: Famous Icebergs of Newfoundland & Labrador - Newfoundland and Labrador, Canada. Right: The Hibernia oil production platform, one of four installations located off the coast of Newfoundland (www.hibernia.ca)

d. Mission Task #3: *Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs*
   Ocean Decade Challenges for collective impact:
   - **#4: Develop a sustainable and equitable ocean economy**
   - **#5: Unlock ocean-based solutions to climate change**
   - **#6: Increase community resilience to ocean and coastal risks**
   - **#7: Expand the Global Ocean Observing System**

Meeting the world's energy needs now *and* into the future is a tricky business. No one source can do the trick. Energy portfolios – of a single country or the entire world – should include a variety of sources, balanced to meet the energy demand while also focusing on sustainability, reliability, a healthy environment, and livelihoods. A diversified energy portfolio is also important for reducing the dependency on a single energy source, which in turn increases energy security and minimizes environmental impacts.

It is a delicate balance, but one that can be achieved when people, companies, and world governments work together to brainstorm and put forward practical, scalable solutions that take these factors into consideration. As the saying goes, where there's a will, there's a way. However, in many cases, the former holds back the latter.

But that is not the case with Equinor's Hywind Tampen, the world's first floating wind farm built to power offshore oil and gas installations. A marriage of renewable and non-renewable energy production, the Hywind Tampen wind farm supplies power to Equinor's Snorre and Gullfaks platforms in the Norwegian North Sea.

The farm uses 11 floating wind turbines to supply renewable electricity to the Snorre and Gullfaks offshore oil and gas platforms. This reduces their emissions (and carbon footprints) and maintains the quality of work life for platform personnel, while developing new offshore wind technology. Hywind Tampen became fully operational in August 2023; it is estimated that the farm provides 35% of the annual power demand for the two platforms.

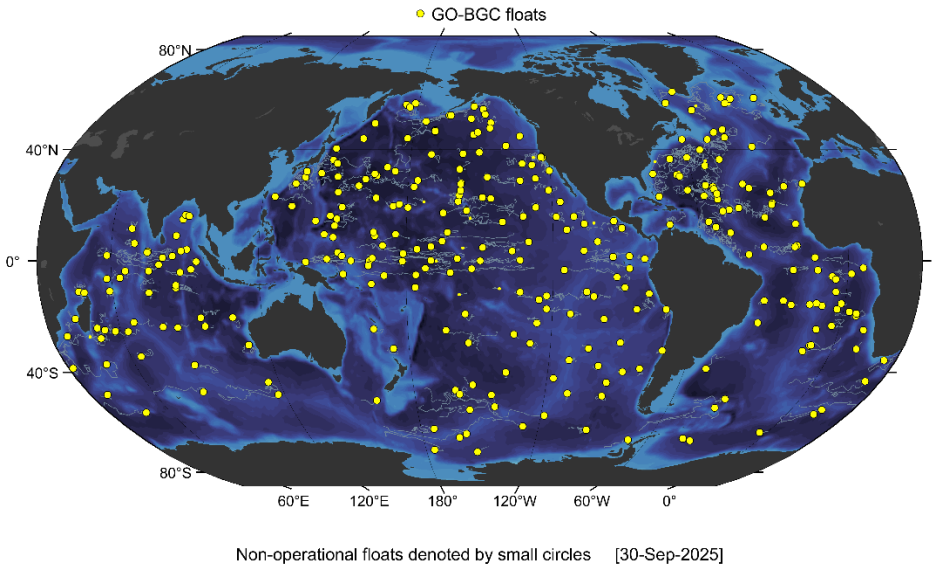
Hywind Tampen will be a test bed for the further development of floating wind farms, which will include exploring the use of new and larger turbines, installation methods, simplified moorings, and concrete substructures. It will also be used to test gas and wind power generation systems, a hybrid approach that helps with grid stability and reliability by balancing the variable and intermittent nature of wind energy with the flexible, on-demand power of natural gas.

Offshore wind turbines and the Snorre oil and gas platform. World's Largest Floating Offshore Wind Farm Officially Opens

e. Mission Task #4: MATE Floats Under the Ice
   Ocean Decade Challenges for collective impact:
   - **#5: Unlock ocean-based solutions to climate change**
   - **#7: Expand the Global Ocean Observing System**
   - **#8: Create a digital representation of the ocean**

MATE Floats! 2026 is inspired by the National Science Foundation (NSF)-funded GO-BGC Project. The goal of GO-BGC is to build a global network of profiling floats with chemical and biological sensors to monitor circulation, chemistry, biology, and overall ocean health. Scientists, engineers, and technicians are using NSF grant funds to build and deploy 500 robotic ocean-monitoring floats

around the globe. GO-BGC hit the 300 mark, with 325 out of the targeted 500 GO-BGC floats deployed or en route to be deployed from research vessels.



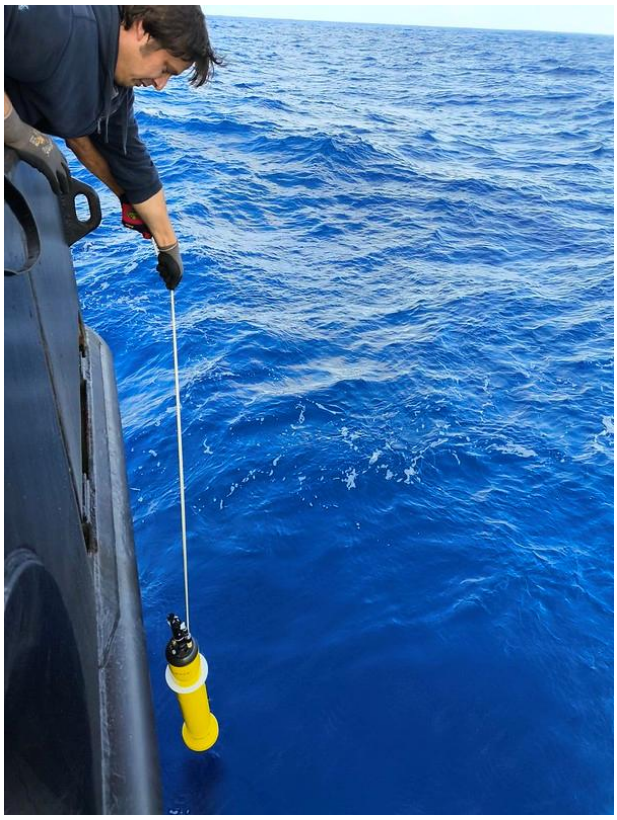
*GO-BGC Float locations as of September 30, 2025 (*Array Status | GO-BGC).

Given the location of the 2026 MATE World Championship, this year's *MATE Floats!* mission scenario takes place UNDER the ice. For regional competitions, this translates to a simulated under-ice task; for RANGER, PIONEER, and EXPLORER companies competing at the World Championship, this means operating under an ice sheet grown in the National Research Council's (NRC) ice tank. At 90 meters long, 12 meters wide, and 3 meters deep, the NRC's ice tank is one of the largest facilities of its kind in the world. With temperatures ranging down to -25°C , this indoor, refrigerated facility simulates realistic Arctic and northern marine conditions and has the ability to grow ice at 2.5 millimeters an hour.

Operating floats in polar waters where they may encounter ice is a real-world challenge faced by GO-BGC float technicians. Sensors and antennas, not to mention the float itself, run the risk of being damaged if the float attempts to surface with an ice sheet overhead. There is also the possibility of floats becoming entrained in sea ice and crushed. Therefore, floats deployed in polar waters must be engineered with ice-avoidance capabilities and with the ability to store data during under-ice profiles and delay transmission until the float is clear to surface in open water. "Ice-avoidance capabilities" translates to sensors measuring water temperature and chemistry to assess if ice is detected as the float ascends to the surface, along with the decision-making capability (i.e., an ice-avoidance algorithm) to reverse course and descend rather than continuing to surface.

Simulating this within the context of a MATE ROV Competition mission task presents some challenges, especially without the ability to replicate the precise real-world conditions – even in an ice tank – that would allow a float with ice-avoidance capabilities to detect ice and reverse course

So, instead of ascending to the surface and transmitting data to the mission station, companies participating in the 2026 MATE ROV Competition are challenged to design and build a float that ascends to a specific depth below the surface and holds that position for a defined period of time before initiating another descend to depth. Only after the float is recovered is it tasked with transmitting its data to the mission station.



Deploying a GO-BGC float (GO-BGC | Global Ocean Biogeochemistry Array)

2. Mission Scope and Purpose

This and the following sections contain the technical specifications and requirements for ROV services needed to support the **Pushing Performance: Science, Technology, & Discovery in Harsh Environments**. In 2026, ROV services include:

1. Task 1. Seabed 2030: A Kaleidoscope of Corals in Cold Water
    - Collect species (basket stars and coral species) from the coral garden
    - Fly a transect over the coral garden
2. Task 2. SmartAtlantic Alliance: Better Information, Better Decisions
    - Collect invasive crab species
    - Survey an iceberg
    - Use the location and heading of the iceberg to determine the threat level of the iceberg to the four area oil platforms
    - Simulate an acoustic release of a retrieval buoy on whale safe fishing gear

- Replace an eDNA sensor, connecting the new sensor to the Holyrood subsea observatory
- Analyze data to determine frequency seen

3. Task 3. Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs
    - Retrieve the power connector from the wind farm subsea station and lay the cable through a waypoint
    - Install the power connector
4. Task 4. MATE Floats Under the Ice
    - Prior to the competition, design and construct an operational profiling float
    - Float completes two vertical profiles
    - Data is graphed as depth over time

3. Specifications

See the specific tasks described below as well as the **VEHICLE DESIGN & BUILDING SPECIFICATIONS** and **COMPETITION RULES** sections.

4. Maintenance and Technical Support

The company shall warrant the ROV and associated systems and equipment for at least the duration of the product demonstrations. Repair or replacement shall be at the company's expense, including the cost of shipping the ROV to and from the competition facility.

During regional events, the company shall provide at least one day of technical support to resolve hardware, software, and operational issues. They shall provide at least three days of the same for the World Championship event.

5. Shipping and Storage

Delivery of the ROV and associated systems and equipment shall be no later than the date of the geographically closest regional contest.

6. Evaluation Criteria

a. Technical documentation
b. Engineering presentation
c. Marketing display
d. Company spec sheet
e. Product demonstration
f. Safety

7. References

a. General
    - United Nations Decade of Ocean Science for Sustainable Development
    - 17 UN Sustainable Development Goals
    - 10 Challenges - Ocean Decade
    - A Hotter Future Is Certain, Climate Panel Warns. But How Hot Is Up to Us

- ESG (environmental, social and governance)
- Decade of Action for Cryospheric Sciences (2025-2034)
- Photos from the 2015 World Championship in St. John's | Flickr

b. Task 1: Seabed 2030: A Kaleidoscope of Corals in Cold Water
    - Rare Coral Habitat Discovered using Rayfin Camera
    - 'Corals as far as the eye can see' a rare find for Marine Institute researchers
    - Spotting soft coral garden off Newfoundland 'once in a lifetime' opportunity, researcher says
    - Photogrammetry - NOAA Ocean Exploration

c. Task 2: SmartAtlantic Alliance: Better Information, Better Decisions
    - European Green Crab in Newfoundland Waters
    - European Green Crab
    - Identification Guide for Eastern Canada Crabs - Wanted Invaders
    - Hibernia
    - Hibernia Platform Collision Avoidance - Offshore Energy Surveillance System
    - Infographic: How Newfoundland deals with its yearly iceberg rush
    - North Atlantic right whale
    - Whalesafe fishing gear
    - SmartAtlantic - Holyrood Buoy 2
    - SmartAtlantic - Holyrood Subsea Observatory
    - BeWild & Fugro Launch Remote Ecology Survey at CrossWind
    - The BeWild project: Advancing marine biodiversity monitoring at offshore wind farms
    - Detecting fish with the innovative Fish Sensing Box

d. Task 3: Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs
    - Fugro Blue Essence Completes First Remote Offshore Wind ROV
    - Hywind Tampen: the World's largest floating wind farm and the first for oil platforms
    - Remote Anchoring & MicroPiler (RAMP)

e. Task 4: MATE Floats Under the Ice
    - GO-BGC | Global Ocean Biogeochemistry Array
    - Expanding Fleet of Autonomous Floating Robots Targets Deeper Understanding of Global Ocean Dynamics
    - Profiling Floats in SOCCOM: Technical Capabilities for Studying the Southern Ocean
    - Ice tank – 90 m research facility - National Research Council Canada

SIZE RESTRICTIONS

None: SCOUT class companies are not restricted on the size of their vehicle. Companies must be able to transport the vehicle and associated equipment to the product demonstration station and to the engineering presentation area by hand. ROV systems must be capable of being safely launched by hand.

PRODUCT DEMONSTRATION

IMPORTANT NOTE: Questions about the competition, the production demonstrations and design and building specifications should be posted to the MATE ROV Competition Forum Board. Questions will be answered by MATE ROV Competition staff so that all companies can see the questions and answers. This will also help to avoid duplicate questions. That said, please make sure that your question(s) has not already been asked – and answered – before posting. It is up to you and your company to read, comprehend, and comply with ALL rulings posted on the site. All pertinent rulings will be posted to the 2026 Official Rulings thread, which will be pinned to the top of the forum board.

TASK 1: *Seabed 2030: A Kaleidoscope of Corals in Cold Water*

This task involves the following steps:

Task 1.1 Collect species from the coral garden

- **Collect two basket stars and return them to the surface, side of the pool – 5 points each, 10 points total**
- **Collect two coral species and return them to the surface, side of the pool – 5 points each, 10 points total**

Task 1.2 Fly a transect over the coral garden

- **Fly a transect – 10 points**

Total points = 30 points

Product Demonstration Notes:

Task 1.1 Collect species from the coral garden

Companies must collect two basket stars and two coral species and return them to the surface, side of the pool.

Two basket stars, simulated by O-balls with a ½-inch PVC base will be located on the bottom of the pool. Companies will receive 5 points for successfully returning each basket star to the surface, side of the pool, 10 points total. Successfully returning a basket star to the surface, side of the pool is defined as removing it from the water and placing it on the pool deck.

Basket stars will weigh less than 5 Newtons in water.

Two coral species will also be located on the coral garden. Coral species will be simulated by colored chenille pipe cleaners attached to a ½-inch PVC tee. Companies will receive 5 points for successfully collecting each coral species, 10 points total. Successfully collecting a coral species is defined as removing it from the water and placing it on the pool deck.

Corals will weigh less than 5 Newtons in water.

Task 1.2 Fly a transect over the coral garden

Companies must fly a transect line over a coral garden. The coral garden will be simulated by ½-inch PVC pipe 3 meters long. Companies must move their vehicle from one end of the transect to the other, keeping their vehicle above the PVC pipe at all times. A station judge will position themselves so they can look down the length of the coral garden transect. If the station judge determines the vehicle is no longer above the coral garden transect, they will inform the company. The company may reposition at one end and start again.

Companies may start at either end of the coral garden. Companies will receive 10 points for successfully flying a transect line over the coral garden. Successfully flying a transect line is defined as moving from one end of the coral garden to the other with the vehicle above the coral garden at all times.

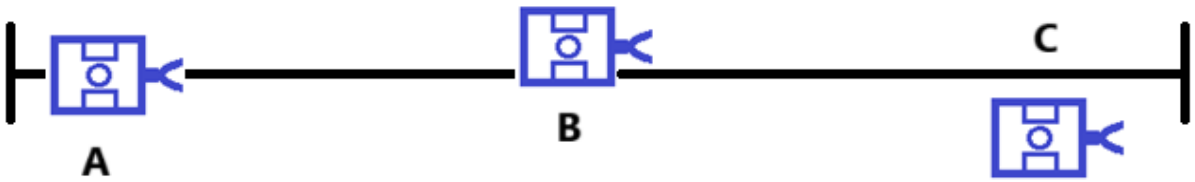


Diagram of an ROV over the coral garden at three positions. Position A shows the ROV over the center of the coral garden transect. Position B shows the ROV near one edge, but still successfully over the coral garden transect. Position C shows the ROV off to one side of the coral garden, failing to successfully fly the transect.

TASK 2: *SmartAtlantic Alliance: Better Information, Better Decisions*

This task involves the following steps:

Task 2.1 Mitigate invasive species

- **Recover two European Green crabs to the surface, side of the pool – 5 points each, 10 points total**

Task 2.2 Iceberg tracking

- **Track icebergs headed towards offshore oil platforms**

    - **Survey the iceberg at two locations – 10 points each, 20 points total**
    - **Use the location and heading to determine the threat level of the iceberg to four area oil platforms – up to 15 points**
        - **Correctly report the threat level to all four platforms – 15 points**
        - **Correctly report the threat level to only three of the four platforms – 10 points**
        - **Correctly report the threat level to only two of the four platforms – 5 points**

Task 2.3 Testing whale safe fishing gear

- **Turn the handle to simulate the acoustic release of the retrieval buoy – 5 points**
- **Release the buoy to the surface – 5 points**

Task 2.4 Service the Holyrood subsea observatory

- **Recover the old eDNA sensor**
    - **Recover the old sensor to the surface, side of the pool – 10 points**
        - **Analyze the sensor's data to determine the percent frequency seen of various organisms – 10 points**
    - **Install a new eDNA sensor**
        - **Place the sensor in the designated area – 10 points**
        - **Connect the sensor to the Holyrood subsea observatory – 5 points**

Total points = 90 points

Product Demonstration Notes:

Task 2.1 Mitigate invasive species

Companies must collect two European Green crabs and return them to the surface, side of the pool.

Two crabs, simulated by 1 ½-inch end caps and chenille pipe cleaners will be located on the bottom of the pool. Companies will receive 5 points for successfully returning each crab to the surface, side of the pool, 10 points total. Successfully returning a crab to the surface, side of the pool is defined as removing it from the water and placing it on the pool deck.

European Green crabs will weigh less than 5 Newtons in water.

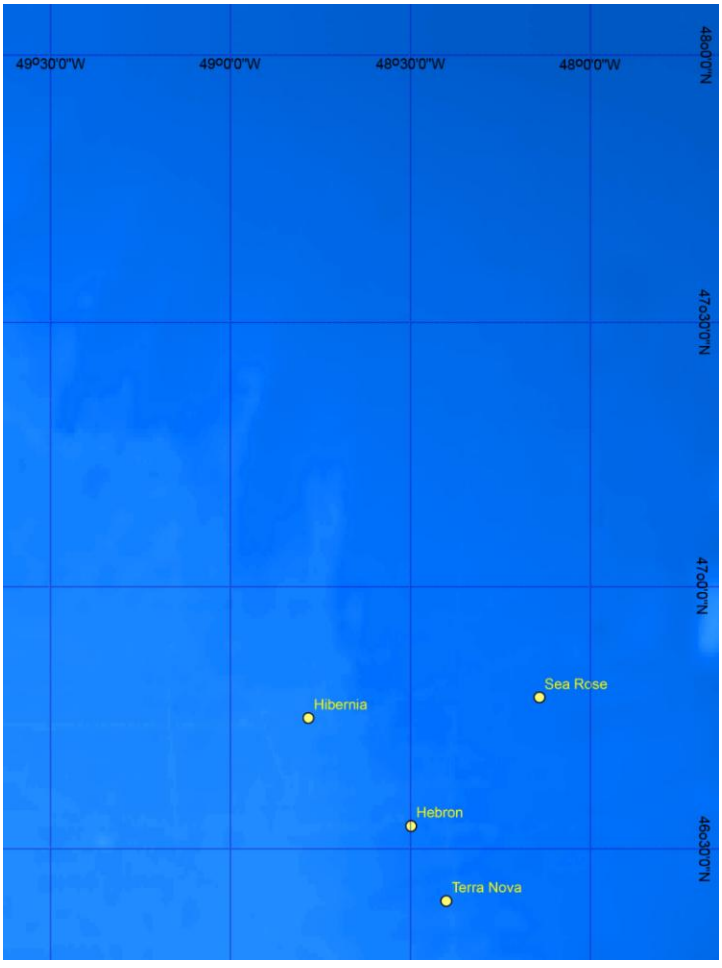
Task 2.2 Iceberg tracking

Companies must track icebergs as they head towards offshore oil platforms. Companies must first survey the iceberg at two locations around its perimeter. The iceberg will be constructed from ½-inch PVC pipe and bubble wrap/clear plastic.

The iceberg will have two locations to be surveyed. To survey the iceberg, companies must attach a marker to each location. Each location will be 20 cm below the surface and be constructed from a 5 cm x 5 cm square of corrugated plastic covered with Velcro hooks. The markers will be constructed from ½-inch PVC pipe with a 3-inch knockout cap attached. A 2.5 cm x 2.5 cm square

of Velcro loops will be attached to the knockout cap. The markers can be carried by a length of rope attached to the knockout cap, or companies may find another way to carry the markers. Two markers will be located on the surface, side of the pool at the start of the product demonstration. Companies will receive 10 points for successfully surveying the iceberg at each location, 20 points total. Successfully surveying the iceberg at each location is defined as attaching the marker via Velcro to each location. If the marker comes off the iceberg location at any time during the product demonstration, companies will lose points for surveying that location. Companies may attempt to reattach the marker to regain those points.

Once companies have surveyed the iceberg at both locations, companies will receive the iceberg information sheet and an offshore oil platform map and data sheet. The iceberg information sheet will contain the location (longitude and latitude) of the iceberg and its heading. The offshore oil platform map will show the location of the four area oil platforms. This map will also include the following table showing the location of the platforms and water depth at each platform. This map and table will also be available in the Product Demonstration Resources section of the MATE ROV Competition website.



A map of the oil platforms.

Platform	Location		Ocean depth (m)
	Latitude	Longitude	
Hibernia	43.7504	-48.7819	-78
Sea Rose	46.7895	-48.1417	-107
Terra Nova	46.4	-48.4	-91
Hebron	46.544	-48.498	-93

A table of oil platforms location and depth.

Using this information, companies must determine the threat level for the four surface platforms. The threat levels are green, yellow, and red. If the iceberg is passing more than 10 nautical miles away from a platform, the iceberg poses a green threat level. If the iceberg is passing between 5 and 10 nautical miles from a platform, it poses a yellow threat level. If the iceberg is passing less than 5 nautical miles from a platform, it poses a red threat level

Note that 1 minute of latitude is equal to 1 nautical mile.

Companies will receive 15 points for successfully using the location and heading to determine the threat level to all four platforms. Successfully determining the threat level is defined as informing the station judge of the proper threat level, green, yellow or red, for each of the four oil platforms. Companies will receive 10 points if they are successful in determining the threat level to three platforms. Companies will receive 5 points if they are successful in determining the threat level to two platforms. Companies that are successful in determining the threat level to 1 or no platforms will receive 0 points.

Task 2.3 Testing whale safe fishing gear

Companies must simulate the deployment and testing of whale safe fishing gear. A whale safe lobster pot will be on the bottom at the start of the product demonstration run. The lobster pot will be constructed from a milk crate with ½-inch PVC pipe and 3-inch PVC pipe. A corrugated plastic sheet attached to ½-inch PVC pipe will cover the 3-inch pipe that holds the 2-inch PVC pipe retrieval buoy. A length of rope, long enough for the buoy to reach the surface, will connect the buoy to the milk crate. Companies must turn a ½-inch PVC pipe handle to simulate an acoustic release of the retrieval buoy. Companies will receive 5 points when they successfully turn the handle and release the buoy. Successfully turning the handle and releasing the buoy is defined as the buoy no longer in contact with the 3-inch PVC pipe. Companies will receive 5 points when the buoy is successfully released to the surface. Successfully releasing the buoy to the surface is defined as the buoy breaking the surface of the water.

Task 2.4 Service the Holyrood subsea observatory

Companies must recover the old eDNA sensor to analyze its data. The eDNA sensor will be constructed from ½-inch and 2-inch PVC pipe and can be carried by a 50 cm length of rope attached to the top of the sensor. At the start of the product demonstration run, the old eDNA sensor will be on the bottom inside the designated area. The designated area will be a 50 cm square constructed from ½-inch PVC pipe painted yellow. Companies will receive 10 points when

they successfully recover the old eDNA sensor to the surface, side of the pool. Successfully recovering the old eDNA sensor is defined as placing the sensor on the pool deck.

The old sensor will weigh less than 5 Newtons in water.

Once the old eDNA sensor has been successfully recovered, the station judge will provide companies with the frequency data. The frequency data will have six species listed, along with the number of times that organism was seen in the videos from the Holyrood subsea observatory. To determine the percent frequency seen, companies must determine the occurrences of each species, calculate the total count of species, then divide each species frequency by the total count. Multiply by 100 to find the percentage frequency. Companies will receive 10 points when they successfully determine the percentage frequency seen of the various organisms. Successfully determining the percentage frequency seen is defined as showing the station judge the percentage frequency for each of the ten species within the videos from the Holyrood subsea observatory.

Species	Number Seen
Snow crab (*chionecetes opilio*)	19
Acadian hermit crab (*Pagarus acadianus*)	3
Spiny Sunstar (*Crossaster papposus*)	8
Sea Urchin (*Stronglyocentrotus droebachiensis*)	10
Boreal Sea Star (*Boreal asterias*)	12
Daisy brittle star (*Ophiopholis aculeata*)	7

A frequency data table of species with numbers seen of each species. Companies calculate the sum total of numbers seen (in this case 59).

Species	Number Seen	% frequency
Snow crab (*chionecetes opilio*)	19	32.20338983
Acadian hermit crab (*Pagarus acadianus*)	3	5.084745763
Spiny Sunstar (*Crossaster papposus*)	8	13.55932203
Sea Urchin (*Stronglyocentrotus droebachiensis*)	10	16.94915254
Boreal Sea Star (*Boreal asterias*)	12	20.33898305
Daisy brittle star (*Ophiopholis aculeata*)	7	11.86440678

A table showing species, numbers seen, and percentage frequency. Percentage frequency is calculated by dividing the number seen for each species by the total (59). For example, for the Snow crab, 19 species were seen out of 59, so the percentage seen in 32.2%.

Companies must then install a new eDNA sensor into the designated location. The sensor will be constructed from ½-inch pipe, 1-inch pipe and 2-inch pipe and can be carried by a 50 cm length of rope attached to the top of the sensor. The connector for the sensor will be constructed from ½-inch PVC pipe. Two meters of cable will attach the sensor connector to the eDNA sensor.

At the start of the product demonstration run the new eDNA sensor will be on the surface, side of the pool. The designated location will be the same as that of the old eDNA sensor. It will be a 50

cm square constructed from ½-inch pipe painted yellow. The old eDNA sensor must be recovered before the new eDNA sensor can be installed.

Companies will receive 10 points for successfully placing the new eDNA sensor in the designated location. Successfully placing the sensor is defined as the sensor no longer in contact with the ROV, completely inside the designated location, and upright. The sensor connector can still be on board the ROV, but the sensor must no longer be in contact with the ROV. The sensor must remain upright and completely inside the designated area for the entire product demonstration run. If the connector comes out of the designated area, or falls over, companies will lose points for placing the sensor into the designated area. Companies may attempt to replace the sensor or turn the sensor upright to regain those points.

The new eDNA sensor will weigh less than 5 Newtons in water.

Companies must then connect the new eDNA sensor to the Holyrood subsea observatory. The Holyrood subsea observatory will be constructed from ½-inch PVC pipe. The connection port on the subsea observatory will be constructed from 3-inch PVC pipe. Companies will receive 5 points when they successfully connect the new eDNA sensor to the Holyrood subsea observatory. Successfully connecting the sensor is defined as the connector no longer in contact with the ROV and inserted into the 3-inch connection port. The sensor connector must stay inserted into the port for the entire product demonstration run. If the connector is removed from the port at any time during the product demonstration run, companies will lose points for connecting the sensor to the Holyrood subsea observatory. Companies may attempt to reconnect the sensor to regain those points.

TASK 3: *Wind-Powered Offshore Oil Platform: Scalable Solutions for Global Energy Needs*

This task involves the following steps:

Task 3.1 Powering an oil platform from a wind turbine

- **Connect the wind farm power connector to the oil platform**
    - **Retrieve the power connector from the wind farm subsea station – 10 points**
    - **Lay the power connector cable through a waypoint – 10 points**
    - **Install the power connector into the oil platform port – 10 points**

Total points = 30 points

Product Demonstration Notes:

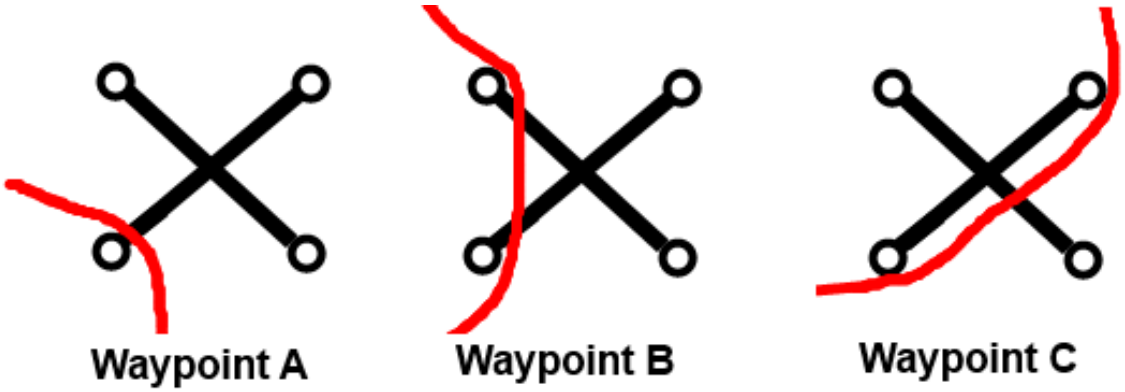
Task 3.1 Powering an oil platform from a wind turbine

Companies must connect the oil platform to the power from the offshore wind farm. The oil platform will be simulated by power connection port; the wind farm will be simulated by the subsea platform and power connector. The oil platform power connector port will be constructed from 2-

inch PVC pipe and a ½-inch PVC framework. The wind farm power connector will be constructed from ½-inch PVC pipe with a screw hook as a carrying mechanism for the power connector. The platform will be constructed from ½-inch PVC pipe and corrugated plastic sheeting. Two meters of wire cable will connect the platform to the power connector.

Companies must retrieve the power connector from the wind farm subsea platform. Companies will receive 10 points when they successfully retrieve the power connector from the wind farm subsea platform. Successfully retrieving the power connector is defined as the connector in control of the ROV and no longer touching the platform or bottom of the pool. If the connector is dropped by the ROV at a later time, companies will not lose their points for retrieving the connector, but will need to recover the connector to complete the remaining product demonstration tasks.

Companies must lay the power connector cable through a waypoint on the seafloor. The waypoint will be constructed from ½-inch PVC pipe. Companies will receive 10 points for successfully deploying the cable through the waypoint. Successfully deploying the cable through a waypoint is defined as the wire inside the four PVC posts of the waypoint. The power connector cable must stay inside the waypoint for the entire product demonstration run. If the cable is removed from the waypoint at any time during the product demonstration run, companies will lose points for laying the cable through the waypoint. Companies may attempt to re-lay the cable into the waypoint to regain those points.



Depiction of successful and unsuccessful cable lying through waypoints. Waypoint A is an unsuccessful cable lay, as the cable is inside one vertical post only. Waypoint B is a successful cable lay, as the cable is inside two vertical posts. Waypoint C is an unsuccessful cable lay, as the cable is only inside one vertical post (the lower right post only).

Companies must install the power connector into the connection port. The end of the connector will be covered by Velcro hooks. The inside of the port will be covered by Velcro loops. Companies will receive 10 points when the connector is successfully installed into the port. Successfully installing the connector is defined as the connector no longer in contact with the ROV, inserted into the 2-inch port, and making a Velcro-to-Velcro stick. Once installed, the power connector must remain installed for the entire product demonstration run. If the connector becomes disconnected, companies will lose their points for installing the connector. Companies may attempt to reinstall the power connector to regain those points.

TASK 4: *MATE Floats Under the Ice*

MATE Floats! 2026 is inspired by the National Science Foundation (NSF)-funded GO-BGC Project. The goal of GO-BGC is to build a global network of profiling floats with chemical and biological sensors to monitor circulation, chemistry, biology, and overall ocean health. Scientists, engineers, and technicians are using NSF grant funds to build and deploy 500 robotic ocean-monitoring floats around the globe. GO-BGC hit the 300 mark, with 325 out of the targeted 500 GO-BGC floats deployed or en route to be deployed from research vessels. These include floats deployed in the polar waters.

Operating floats in polar waters where they may encounter ice is a real-world challenge faced by GO-BGC float technicians. Sensors and antennas, not to mention the float itself, run the risk of being damaged if the float attempts to surface with an ice sheet overhead. There is also the possibility of floats becoming entrained in sea ice and crushed. Therefore, floats deployed in polar waters must be engineered with ice-avoidance capabilities and with the ability to store data during under-ice profiles and delay transmission until the float is clear to surface in open water. "Ice-avoidance capabilities" translates to sensors measuring water temperature and chemistry to assess if ice is detected as the float ascends to the surface, along with the decision-making capability (i.e., an ice-avoidance algorithm) to reverse course and descend rather than continuing to surface.

Given the location of the 2026 MATE World Championship, this year's EXPLORER, PIONEER and RANGER *MATE Floats!* mission scenario takes place UNDER the ice in the National Research Council's (NRC) ice tank. But for NAVIGATOR and SCOUT class teams at regional competitions, this translates to a simulated under-ice task.

While SCOUT class companies are not tasked with operating under the ice, they are being tasked with a new challenge – designing a float with a buoyancy engine. A buoyancy engine moves fluid from inside the float to outside the float, displacing seawater and changing the volume and thus the density of the float. This moves the float vertically (up and down) in the water. And like last year, *MATE Floats!* is also challenging SCOUT class companies to incorporate decision-making into their floats by developing a program or code that controls the movement of the float. This means that the float is programmed to autonomously descend to the bottom and return to the surface (i.e., complete a vertical profile).

This task involves the following steps:

Design and construct an operational vertical profiling float

- **Prior to the competition, design and construct a vertical profiling float – 5 points**
- **Deploy the float in the designated area – 5 points**
- **Float completes two vertical profiles**

- **Float uses a buoyancy engine**
  - **Completes first vertical profile operating autonomously – 15 points**
  - **Completes second vertical profile operating autonomously – 15 points**

    or
  - **Completes first vertical profile operating manually – 10 points**
  - **Completes second vertical profile operating manually – 10 points**

  or
- **Float uses another mechanism**
  - **Completes first vertical profile operating autonomously – 10 points**
  - **Completes second vertical profile operating autonomously – 10 points**

    or
  - **Completes first vertical profile operating manually – 5 points**
  - **Completes second vertical profile operating manually – 5 points**

- **MATE provided temperature and depth data is graphed**
  - **MATE provided data is used to graph depth over time – up to 10 points**
    - **Graph is plotted using a computer program – 10 points**
    - **Graph is plotted by hand on paper – 5 points**

Total Points = 50 points

Product Demonstration Notes:
Prior to the competition, companies must build a float capable of completing two vertical profiles (i.e., traveling from the surface to the bottom of the pool, then ascending back to the surface).

Companies have two major choices when designing and building their float. The float can use a buoyancy engine or a different mechanism (something other than a buoyancy engine) to complete vertical profiles. As described above, a buoyancy engine moves fluid from inside the float to outside the float, displacing seawater and changing the volume and thus the density of the float. This moves the float vertically (up and down) in the water. Using motors to move air or liquid does constitute a buoyancy engine. Using motors as thrusters to directly move the float, by turning a propeller or emitting a jet of water, is considered using a different mechanism.

Also, companies can design a float that operates autonomously or manually. A float that operates autonomously uses a computer program to move the float vertically through the water, while a manually controlled float is controlled by a company member on the surface, side of the pool. Companies that use a computer program to control the float are allowed to manually start the process, but once started, the computer program must issue commands so that the float descends to the bottom. Companies may not manually reverse the process to bring the float to the surface; a computer program must do this autonomously. Companies that manually control the float are allowed to have a company member controlling the buoyancy engine or thruster motor. This would include a switch controlling the direction of a thruster motor, a manual pump pushing air into an

open bottomed section of the float, or a manually operated syringe on the surface opening and closing a syringe on the float.

Design specifications for the vertical profiling float:

- Propellers (if used) must be enclosed inside the frame of the float or shrouded. The propeller should not be able to touch any surface of the pool. Floats with propellers protruding outside the framework will not pass safety inspection and cannot be used.
- Must operate independently of the ROV. The float must go down and up independently of the ROV (on its own).
- Any power source for the float must be on the surface. Electronics/computer boards (Arduino/Raspberry Pi, etc.) may be on the surface or on the vehicle.
- All profiling floats must be connected to the surface by a tether and/or other lines. Floats using electrical power must be connected to the MATE power supply. Onboard batteries or onboard power is not allowed. Floats not using electrical power must still be connected to the surface by an airline tube, rope or other line.
- Must be less than 50 centimeters in overall height. The float may not have a diameter/length/width greater than 15 cm.
- May not use an air compressor to send compressed air to the float but may use a manually powered pump to push air into an open bottom container. Likewise a manually powered syringe could open and close a syringe on the float.
- MUST operate as a non-ROV device. See below for additional information on powering non-ROV devices.

Companies will receive 5 points for successfully designing and constructing a vertical profiling float. Successfully designing and constructing a float is defined as bringing the profiling float to the mission station and explaining to the judge how it operates (how it moves up and down in the water column). This explanation must cover whether your float uses a buoyancy engine or uses a different mechanism and whether your float operates autonomously or manually.

Companies must deploy their float in a designated location. The designated location is defined as anywhere beyond a green mark set 1.5 meters out in the pool. Companies will receive 5 points when they successfully deploy their float. Successfully deploying the float is defined as the float no longer in contact with the ROV, floating on the surface, and beyond the green mark 1.5 meters away from the side of the pool. The ROV must deploy the float; companies cannot throw their float beyond the 1.5 meter mark. If the float is released before reaching the designated location, companies are permitted to retrieve the float and reposition it in the designated location. However, the team can alternatively choose to forgo the 5 points for successfully deploying the float and begin its vertical profile tasks.

The float should attempt to complete two vertical profiles. A vertical profile is defined as the float on the surface of the water, descending to the bottom of the pool, then ascending to and breaking the surface of the water. Depending on the float design, companies will receive variable points for completing two vertical profiles.

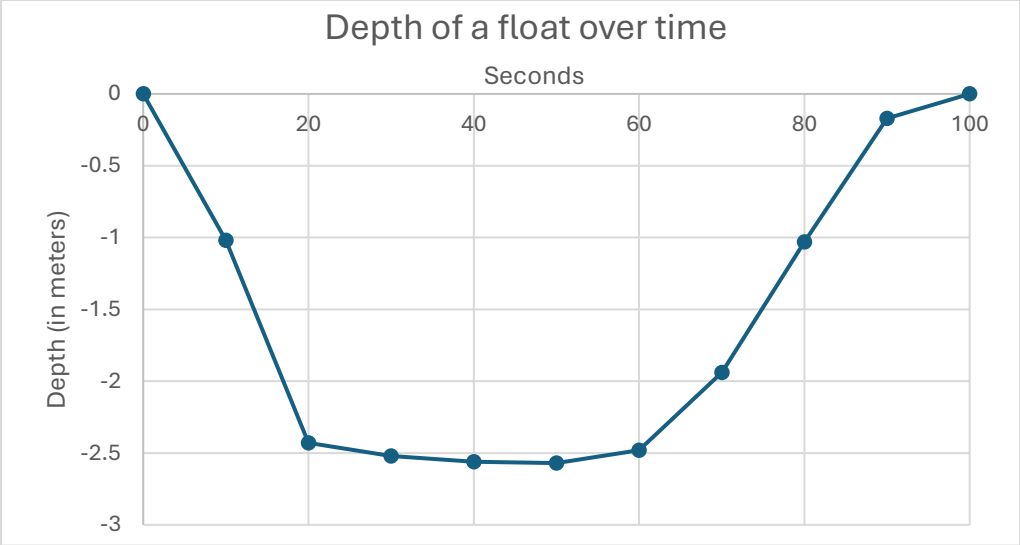
If a company designs its float using a buoyancy engine, and the float operates autonomously, companies will receive 15 points for completing the first vertical profile and 15 points for completing their second vertical profile. If a company designs their float using a buoyancy engine and the float operates manually, companies will receive 10 points for completing their first vertical profile and 10 points for completing their second vertical profile.

If a company designs their float using another mechanism (i.e., uses something other than a buoyancy engine), and the float operates autonomously, companies will receive 10 points for completing their first vertical profile and 10 points for completing their second vertical profile. If a company designs their float using another mechanism, and the float operates manually, companies will receive 5 points for completing their first vertical profile and 5 points for completing their second vertical profile.

Companies must also create a graph of data provided by MATE. Companies will have access to this data at the beginning of their product demonstration run; companies do not need to successfully complete vertical profiles to receive the MATE provided data. Companies will receive 10 points for successfully graphing depth over time using a computer program, or 5 points when they successfully create a graph on paper. Successfully graphing depth over time is defined as showing the station judge a graph with time on the X axis and depth on the Y axis. All dots should be linked by a line. Companies may use Excel or another computer program to plot their data points. MATE will not provide computers or graph paper at the mission station; companies must provide their own method for graphing the data. All graphs must have their axes labeled.

An example of MATE supplied data and graph resulting from the data:

Time	Depth (in meters)
0	0
10	-1.02
20	-2.43
30	-2.52
40	-2.56
50	-2.57
60	-2.48
70	-1.94
80	-1.03
90	-0.17
100	0



PRODUCT DEMONSTRATION RESOURCES

Product Demonstration resources can be found on the Competition Class page. These resources include:

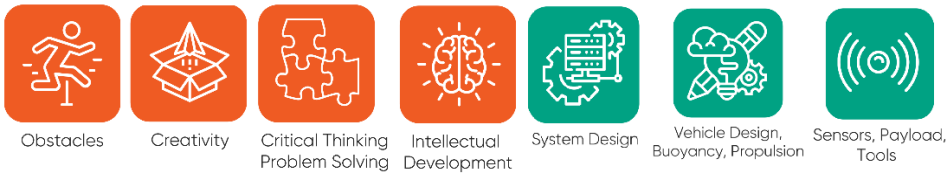
- Offshore oil platform map in color and in black and white.
- The oil platform information table.
- Iceberg track practice examples.
- eDNA sensor frequency seen practice examples.
- MATE Floats data practice examples.

PRODUCT DEMONSTRATION RESPONSIBILITIES

Companies are responsible for designing, building, and bringing their own operational vertical profiling float. Companies must also design and bring any tools or devices to complete the required MATE product demonstration tasks.

The MATE ROV Competition will provide all of the remaining product demonstration items.

PRODUCT DEMONSTRATION PROP BUILDING INSTRUCTIONS & PHOTOS



The Product Demonstration Prop Building Instructions & Photos will be released separate from the competition manual.

PART 2: VEHICLE DESIGN & BUILDING SPECIFICATIONS

1.0 GENERAL

IMPORTANT NOTE: Questions about the competition, including the production demonstrations and design and building specifications, should be posted to the MATE ROV Competition Forum Board. Questions will be answered by MATE ROV Competition staff so that all companies can see the questions and answers. This will also help to avoid duplicate questions. That said, please make sure that your question(s) has not already been asked – and answered – before posting. It is up to you and your company to read, comprehend, and comply with ALL rulings posted on the site. All pertinent rulings will be posted to the 2026 Official Rulings thread, which will be pinned to the top of the forum board.

When emailing their question, companies should reference:

- Any specific specification or rule (e.g. ELEC-002S)
- Competition class

Conventions: All values contained in this document are threshold values unless specifically stated otherwise. All water depths are given in meters (m). All dimensions and measurements utilize SI units.

Your regional coordinator or your regional contest's website, will inform you of any specific requirements or changes for your regional.

2.0 SAFETY

Safety is the competition's primary concern and guiding principle. Any system that is deemed unsafe by competition officials will not be permitted to compete. If a safety concern is identified during the initial inspection, companies are permitted to modify their system and have it re-inspected. Companies are permitted to have their vehicle re-inspected twice. If a company fails to pass its third and final safety inspection, it is disqualified from the underwater competition portion of the event. There are NO APPEALS once an ROV has been disqualified.

NOTE for 2026!!!

MATE ROV Competition safety inspectors will be reinforcing the competition's emphasis on safety and good workmanship. Wiring discipline/workmanship (ELEC-011S) and strain relief at both ends of the tether (ELEC-012S) will be areas of particular emphasis. **Not only is your vehicle required to meet all of the safety requirements, but it should also be a reflection your company's workmanship and attention to detail. Your vehicle's wiring, strain relief, and electronics must be safe and should also look professional**. Additional examples of wiring workmanship will be included in the MATE ROV Competition Safety Inspection Tutorial.

Examples of safety violations from previous ROV competitions include:

- The ROV does not use Anderson Powerpole connectors to attach to main power.
- No SID was provided at the safety check.
- The ROV does not have a main fuse.
- The SID did not show a main fuse.
- Sharp items, or potentially sharp items, (fishing hooks, glass bottles, Mercury thermometers) were included on the vehicle.
- The vehicle motors were not waterproofed.
- Propellers were not protected inside the framework or were not shrouded.

2.1 Safety Inspection Protocol

1. Before entering the water for practice or a product demonstration run, the ROV system must go through a safety inspection. Once a company successfully passes inspection, they will turn in their safety inspection sheet to the safety inspector and receive a Blue PASSED Card with their company number on it. Companies must present the Blue PASSED Card to the pool practice/product demonstration coordinator before their vehicles are permitted to enter the water.
2. Competition staff will conduct a safety inspection of the vehicle using the safety inspection rubric.
3. If the safety inspector(s) identify a safety violation, companies will have the opportunity to address it. The pool practice or product demonstration run schedule will NOT change to allow companies more time.
4. If during the second safety review the
    a. violation has not been properly addressed or
    b. another violation is revealed

    companies will have ONE additional opportunity to address the issue.
5. If during the third safety inspection a violation still exists, safety inspectors will request that the Chief Judge(s) review the violation. If the Chief Judge(s) confirms the violation, companies will not be permitted to participate in the underwater product demonstration component of the competition. However, companies can still participate in the engineering and communication (technical documentation, engineering presentation, and marketing display) component.
6. Reminder: All companies must present the Blue PASSED Card to the pool practice or product demonstration judge before placing their vehicles in the water. In addition, product

demonstration station judges and competition officials can pause or stop a product demonstration run at any time if they feel that there is a potential safety concern.

Your regional competition may use a system other than a Blue PASSED Card, but all companies must pass a safety inspection before entering the water. Contact your regional coordinator or visit your regional contest's website to determine if a Blue PASSED Card or another system will be used for safety verification.

2.1.1 System Interconnection Diagram (SID)

To pass the safety inspection, companies must provide a system interconnection diagram (SID) of their vehicle control system. An SID is an electrical diagram of their wiring, including their control box, motors, and any other electrical systems on their vehicle. The SID should separate and show what systems are on the surface and what systems are on the vehicle. The SID must not exceed one page in length. **The diagram MUST show an ROV system fuse. SIDs that do not show a fuse, utilizing an ANSI, NEMA or IEC symbol, with the size of the fuse marked, will not pass their safety check.**

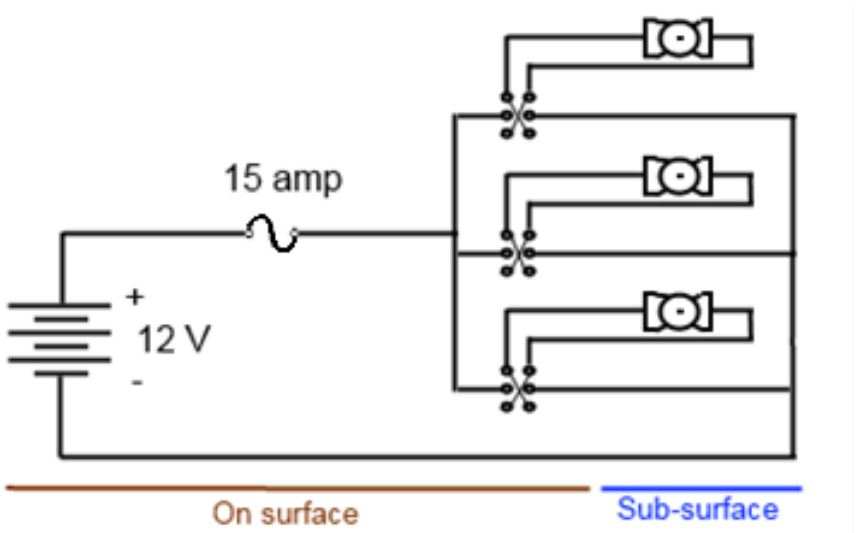
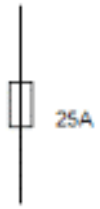


Diagram: An example of an acceptable SID.

Companies should create their own SID. Do not simply copy the above SID, or another SID produced by MATE, including those provided with kits purchased through the SeaMATE store. SIDs help to understand how electricity flows through your system and will provide a better understanding of ROV operations.

DOC-001: Any electrical diagram should use ANSI, NEMA, or IEC symbols as often as possible; it is required for the fuse. They should be neatly hand drawn or created using a CAD software program.

Item	ANSI	IEC
FUSE		

ANSI: American National Standards Institute
IEC: International Electrotechnical Commission
NEMA: National Electrical Manufacturers Association

Note: Companies that do not hand draw their SID may use free drawing software such as MS Paint or OpenOffice to create their diagrams.

NOTE for 2026!!!
Companies building a vertical profiling float (Task 4: *MATE Floats Under the Ice!*) **MUST** create a SID for their profiler. The float SID must follow the same rules as the ROV SID. The float SID can be included on the same page as the main ROV SID or may be a separate page.

2.1.2 Safety Inspection Completed

Companies must complete their safety inspection before entering the water for practice or a product demonstration run on the day of their competition.

3.0 SPECIFICATIONS

The ROV system (or "system") must meet the following requirements:

3.1 Operational

3.1.1 Multiple Vehicles

OPER-001: MULTIPLE VEHICLES ARE NOT PERMITTED. Companies are required to design and build ONE ROV that can complete the necessary product demonstration tasks. All ROV components, including cameras and payload tools, must be connected to the ROV.

3.1.2 Environmental

OPER-002: The ROV System must be able to function in fresh, chlorinated water with temperatures between 15°C and 30°C. The water should be considered conductive of electrical currents.

OPER-003: Visibility in the pool is unlimited. The pool will not be covered or purposefully darkened in any way. However, wind, divers, or ROVs may create ripples on the surface that affect visibility. Companies should plan accordingly.

OPER-004: There will be no water currents intentionally created. However, depending on the venue, pressurized pool filtration system outlets may cause unexpected currents.

Note: Contact your regional coordinator or visit your regional contest's website to learn more about the environmental operating conditions of the competition pool. Some pools may have sloping bottoms or other features that could affect your ROV's performance.

3.1.3 Service Requirements

OPER-005: Companies shall provide a product demonstration team of at least 3 but no more than 4 people to operate the ROV on the pool deck. Companies may have more than 4 people, but only 4 company members are allowed on the pool deck to operate the vehicle.

3.1.4 Maintenance and Calibration Requirement

OPER-006: All work and system maintenance during operations shall be conducted by company personnel. Work of any kind must NOT be done by mentors or advisors.

3.2 Mechanical/Physical

This section of the document provides specifications for the mechanical properties of the ROV system.

3.2.1 Tether Length

MECH-001S: ROVs must be capable of operating in a maximum pool depth of 4 meters (13 feet). All underwater product demonstrations will take place within 6 meters (20 feet) from the side of the pool. Tether lengths should be calculated accordingly.

Note: Many SCOUT class competitions are held in water less than 4 meters deep. Contact your regional coordinator or visit your regional contest's website to determine the maximum depth of the SCOUT competition.

3.2.2 Vehicle Deployment and Recovery

MECH-002S: The product demonstration team must be able to carry the entire vehicle by hand. The crew must be able to hand launch and recover the ROV. No lifts or levers may be used to launch the ROV.

3.235 Propellers

MECH-003S: Propellers must be enclosed inside the frame of the ROV or shrouded. Companies that have propellers protruding outside of their frame will not pass the safety inspection and will not be allowed to compete.

3.3 Electrical

ELEC-001S: All power provided to your ROV system must be obtained from the MATE competition power supply. This is a singular point of connection; all power to your ROV must pass through the MATE-provided fuse on the supply AND the single fuse in your wiring.

ELEC-002S: MATE will provide a nominal 12VDC power source at the product demonstration station. This power source may be a battery or a power supply. Nominal voltage may be as high as 14.8 volts.

ELEC-003S: Voltage may never be increased above the nominal 12 volts anywhere in the ROV system.

3.3.1 Non-ROV Device Power Specifications

The vertical profiling float is considered a non-ROV device. This is a device separate from the ROV that a company can deploy and control to fulfill its mission. The following are rules for the float.

ELEC-NRD-001: If using electricity, the vertical profiling float MUST be powered from the surface, it may not use onboard batteries. **Voltage is limited to 12 VDC maximum; amperage is limited to 5 amps maximum**. All electrical power for the non-ROV device must come from a surface supply, must go down tether wires, and must go through a single fuse (see ELEC-NRD-004).

ELEC-NRD-002: The vertical profiling float non-ROV device may use thrusters or a buoyancy engine to descend/ascend but no cameras are allowed on the float.

ELEC-NRD-003: Connection to power must be red/black Anderson Powerpole Connectors. The red and black pole pieces must be attached together. Loose Powerpoles (those not attached together) will not pass safety inspection. MATE will provide a 12-volt power source for the float at the mission station.

ELEC-NRD-004: A 5-amp (or less) fuse is required. The fuse must be installed in the positive power supply line within 30 cm of the power supply attachment point.

- ATO type blade fuses or MINI blade fuses MUST be used for any fusing. These fuses provide easy visual inspection for amperage using industry standard color codes.
  Fuse Reference: ATO fuse MINI fuse
  These fuses are all rated for 32VDC and are color coded for amperage.
- All blade fuses MUST correspond to the standardized color codes listed on the fuse links above.

3.3.2 Current

ELEC-004S: ROVs are limited to 15 amps.

The ROV **MUST** have a 15A maximum (or smaller) fuse in the positive power supply line within 30 cm of the positive Anderson Powerpole connector. The SID must show this fuse, using a proper fuse symbol, and include the amperage rating of the fuse.

NOTE for 2026!!!

Companies MUST use ATO type blade fuses or MINI blade fuses. These fuses provide easy visual inspection for amperage using industry standard color codes.

Fuse Reference: ATO fuse MINI fuse

These fuses are all rated for 32VDC and are color coded for amperage. All blade fuses MUST correspond to the standardized color codes listed on the fuse links above.

COMPANIES WITHOUT A PROPER BLADE FUSE WILL NOT PASS SAFETY INSPECTION!

NOTE for 2026!!!

ELEC-005S: ROV systems are allowed only one replacement fuse during the product demonstration run. In the event that the ROV system blows the second fuse during the product demonstration, time will stop, the product demonstration run will be over, and no additional points will be earned. Note: Companies must provide their own replacement fuses. MATE will not provide replacement fuses.

Note for 2026!!!

The required ATO or mini fuse **MUST** be within 30 cm of the connection to the MATE 12-volt power supply. There should be no other components between the Anderson powerpole connections that connect to the MATE supply and the fuse.

3.3.3 Power Connections

ELEC-006S: Power supply connections will be red/black Anderson Powerpole Connectors. Companies' ROV system power wires must have proper connectors to obtain power.

NOTE for 2026!!!

The red and black pole pieces must be attached. Loose Powerpoles (those not attached) will not pass safety inspection.

30 Amp Permanently Bonded Red/Black Anderson Powerpole Connectors | Powerwerx
or
30 Amp Unassembled Red/Black Anderson Powerpole Connectors | Powerwerx
or
ASMPP30-1X2-RK Anderson Power Products, Inc. | Connectors, Interconnects | DigiKey

These are two-piece connectors as shown in the picture below.

ELEC-007S: The power supply may be located up to 2 meters from the station and may be located on either side of the station. MATE recommends a power cable long enough to reach the power supply up to 3 meters from your control system.

3.3.4 Exposed Connections and Disposable Motors

ELEC-008S: All electrical components going into the water must be waterproofed. ROVs with electrical connections that are exposed to the water and not sealed will not be permitted to enter the pool. Disposable motors (motors with no waterproofing) are not permitted. Taping a connection with only electrical tape does not constitute a sealed connection. The process of sealing electrical connections must include methodologies such as, but not limited to, silicone RTV, hot melt glue, epoxy, self-vulcanizing tape, and enclosing the connection inside a housing.

3.4 Onboard Electrical Power

ELEC-009S: Onboard electrical power (i.e., power not provided by the tether) is not allowed on the primary ROV.

3.5 Power Shutdown

ELEC-010S: For safety purposes, any ROV system that is disconnected from the surface supply must stop functioning in less than 5 seconds.

3.6 Fluid Power

Any vehicle using fluid power must provide a fluid power diagram. Fluid power is defined as hydraulic pumps (water) or pneumatic pumps (air) on the vehicle or on the surface

FLUID-001S: Electrical pumps of any sort are NOT allowed. Companies may only use manual pumps (hand or foot pumps) to push fluids (including air) down the tether and to their vehicle.

FLUID-002S: Companies may only use WATER as their hydraulic fluid. Companies may only use AIR as their pneumatic fluid.

FLUID-003S: Companies may not use pressure accumulators. Pressure inside any container must never exceed the ambient pool pressure. If air is pumped into a container on the vehicle, that

container must be open to the water. Vent holes on the container must be at least ¼-inch (6.35 mm) in diameter.

For example: A company wants to fill a PVC pipe container on the vehicle with air. Companies may only use a manual pump (hand/foot powered bicycle pump) to push air down to the vehicle. The company drills four ¼-inch holes in the bottom of the pipe. As they pump air into the container, it will displace the water out of the holes in the bottom of the pipe. However, the pressure inside the container can never get above the ambient pool pressure; excess air will come out the holes on the bottom of the pipe once all the water has been displaced.

3.7 Control Systems

ELEC-011S: Control systems must be built in a neat and workmanship-like manner. Loose components and unsecured wires may not pass safety inspection. All wires entering and leaving the control system must have adequate strain relief and wire abrasion protection as the wires pass through the box. All wires entering or leaving the ROV must have adequate strain relief and wire abrasion protection as well.

ELEC-012S: Companies must use proper strain relief and abrasion protection where wires and the tether enter the vehicle. The ROV should be capable of being lifted by the tether without damaging the tether connection to the ROV. Tape, glue, zip ties, and other quick methods of strain relief are not acceptable. The intent is to see the wires pass through a connector specifically designed to provide strain relief.

Companies must use proper strain relief at the surface where wires and the tether enter the control system. Pulling on the tether should not strain the wires entering the control system or computer/laptop.

NOTE for 2025!!!

Additional information on expected and accepted practices for design and wiring of your system, including proper strain relief, can be found in the following MATE ROV Competition Tech Bulletin:

- **MATE ROV Competition Tech Bulletin – MATE Expected Work Practices**

Not all areas of the MATE Expected Work Practices may apply to your vehicle, but make sure to follow the guidance of those that do.

3.8 Cameras and Monitors

CAM-001S: Cameras are not required in the SCOUT class. However, if a company chooses to use cameras on their ROV, they are limited to one video display screen. This monitor must be provided by the company; MATE will not provide a video display monitor for SCOUT companies.

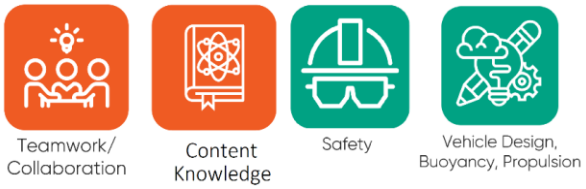
CAM-002: All cameras and the one monitor MUST be powered from the MATE 12-volt supply. Companies may not plug cameras or the monitor into AC wall sockets. Companies may not use their own battery packs or USB to run cameras or monitors. NO EXCEPTIONS.

Regional competitions may not allow cameras on SCOUT class vehicles. Contact your regional coordinator or visit your regional contest's website for more information.

3.9 Lasers

SCOUT class companies may NOT use lasers on their vehicles.

PART 3: COMPETITION RULES



4.1 GENERAL

- All members of the company and their supporters must follow the safety regulations of the ROV competition, pool facility, and event venue.

- All company members and their supporters are expected to conduct themselves in a professional and responsible manner during the competition. Disrespectful behavior towards the judges, officials, pool staff, audience, or other companies will lead to penalty points or disqualification.

- Sabotaging, stealing, or pilfering equipment of other companies will lead to disqualification. Companies found cheating will also be disqualified.

- The MATE ROV competition is, at its core, designed to be an educational and inspirational event for **STUDENTS**. It is designed to challenge them to apply the physics, math, electronics, and engineering skills they are learning in the classroom to solving practical problems from the marine workplace. (See the MATE Competition Philosophy.)

  It is expected that all "adults" (non-students; e.g. teachers, mentors, parents) involved in the competition limit their input to educational and inspirational roles. Actual construction of the ROV (particularly in the complex electrical and software areas) must be completed by the students. Adults should teach and advise students about design, electronics, software, and

construction, but not complete the work for the students. Throughout the process adults are encouraged to focus on benefits to the students from the process and not simply winning. If it becomes apparent that adults exercised more than an advisory role, judges reserve the right to deduct points or, in extreme cases, disqualify companies from the competition.

ALL work done on the vehicle must be conducted by company members. This includes any work done at home, at school, or during the MATE ROV competition (World Championship and regional). Teachers, mentors, parents, and non-competing students are not permitted to work on the ROVs. They may provide advisory input, but they may not work on the ROV directly. This includes writing or editing software code. All mechanical, electrical, and software modifications and/or repairs to the ROV must be completed by students.

With learning at its core, the MATE competition encourages students to utilize and build upon their skill sets to find creative solutions to designing and building their ROV. Students gain valuable skills and knowledge when creating a component from "scratch," which is apparent to judges as they review the technical documentation and engineering presentation. However, as they move through the process of analyzing their designs and identifying building materials, students may decide to either build a component from "scratch" or purchase it from a commercial vendor.*** So, while original solutions are encouraged, the use of commercial components is acceptable, provided 1) that the components adhere to the design and building as well as safety specifications for the particular competition class and 2) more importantly, that the students can provide a reasonable, logical explanation for buying versus building.

The competition scoring rubrics are designed to reflect this; points are awarded based on students' abilities to explain and justify how all of the components and systems work together as an integrated ROV, regardless of if they purchased them, pulled them from public libraries, or made them themselves.

***Note "commercial vendor" includes the SeaMATE store and other competition programs that sell educational robotics kits. SeaMATE kits were created to remove barriers to participation for teachers and schools unable to easily 1) find parts and materials and 2) set up accounts with multiple vendors. The kits are part of a larger educational package that includes curriculum materials, videos, and other resources to support and enhance learning. And learning is what students who use SeaMATE (or other) kits will be expected to demonstrate during and through the ENGINEERING & COMMUNICATION components.

It should be noted that purchasing and competing with complete, pre-assembled, commercial ROVs is not permitted.

4.2 PROCEDURAL

- Companies must compete during their assigned time slots. Your company is **NOT** permitted to switch time slots with another company. Failure to show for your scheduled product demonstration or for your company's engineering presentation will result in "no score" for that particular competition category. **No exceptions.** Assigned time slots will be sent out in advance so that any scheduling concerns can be addressed prior to the event.

- While there is no limit to the number of students who can compete as part of a company, **the product demonstration team (aka demo team) is limited to four students**. The demo team is defined as the team of students who operate the vehicle and its associated equipment during the product demonstration. Only four students will be allowed to enter the product demonstration station, launch, pilot, and perform the tasks. Instructors, mentors, and/or non-student members cannot participate as part of the demo team. If a regional offers two product demonstration attempts, **companies may alternate students on the demo team for the two product demonstration attempts.** (All members of the company should participate in the engineering and communication components; see ENGINEERING & COMMUNICATION for more information.)

- Only the demo team members and judges are allowed at the product demonstration station during the product demonstration, which includes the set-up and demobilization periods. Other members of the company, instructors, mentors, audience members, and observers (press or special invited guests) must remain outside the product demonstration station or in designated viewing areas.

- Instructors, mentors, parents, and "fans" are **NOT** permitted at the safety inspection stations or repair tables. Two warnings will be issued before individuals not heeding this rule will be asked to leave the venue.

- In addition, instructors, mentors, parents, and fans are **NOT** permitted to work on the ROV. Individuals who are seen working on the ROV who are not student company members will be issued a warning. Two warnings will be issued before individuals not heeding this rule will be asked to leave the venue. If companies choose to take their ROVs off the competition grounds for maintenance and repair, they are expected to observe this rule in the interests of the spirit of the competition.

- Video devices may be used to record the underwater activities for entertainment and learning purposes **only**. Video will not be used as an instant replay to review judges' decisions or to challenge product demonstration timing.

- Companies will compete in one product demonstration that will consist of four tasks. Companies will get TWO attempts at the one product demonstration. The higher of the two

scores will be added to the engineering and communication score to determine the total, overall score for the competition.

- The product demonstration time consists of a 3-minute set-up period, a 10-minute performance period, and a 2-minute demobilization period. If the demo team and all of their equipment are not out of the product demonstration station at the end of the 2-minute demobilization period, the company will be **penalized 1 point for each additional minute**.

  Note: Regional competitions *may not* offer two attempts at the product demonstration. In addition, the product demonstration time frames for set-up, performance period, and demobilization may be different at your regional contest. Contact your regional coordinator or visit your regional contest's website for more information.

- Manipulating the tether to free it from underwater obstacles is permitted. Pulling on the tether to speed up the recovery of items or to return your vehicle more quickly to the surface is not permitted and will result in penalty points. Judges will issue one warning if tether pulling occurs. Each future infraction will result in **5** points deducted from the final product demonstration score.

- If your vehicle is completely disabled and/or its tether tangled and unable to free itself from the underwater environment, SCUBA divers can be called in to assist. However, the product demonstration time will NOT stop and **5** points will be deducted from the final product demonstration score.

  Diver assistance may not be available at your regional competition. Contact your regional coordinator or visit your regional contest's website to determine if diver assistance will be available at your regional competition.

- Companies are not permitted to leave debris in the pool. Any debris must be recovered by the ROV before time has expired or the company will be penalized. Debris is defined as pieces of the ROVs, weights, floats, or other items created by the company. Task props are not considered debris unless noted in the Product Demonstration section. The product demonstration notes section may cover special items that can be left in the pool after time has expired.

- No demo team member shall enter the water to complete an object recovery. Only arms and hands are allowed into the pool to retrieve an object or to retrieve the vehicle. Companies will be disqualified or penalized depending on the severity of the infraction.

- Communication using cell phones, text messaging, and online social media tools such as Teams, Zoom, Skype, Facebook, Twitter, instant messaging, etc. is NOT permitted during the product demonstration, either between the demo team members at poolside or between any

demo team member and anyone outside of the product demonstration station.

- **Product demonstration judges and other competition officials will only communicate with students.** Judges and officials will NOT communicate with mentors, parents, or other non-student members regarding product demonstration information, challenges, or other issues except during pre- and post-competition briefing sessions.

  Companies that wish to issue a challenge during the product demonstration run should immediately communicate this challenge to the product demonstration judges. The judges will discuss and attempt to resolve the issue. If a decision cannot be made, the product demonstration judges will consult with the head judges and competition technical manager to resolve the issue.

4.3 DESIGN & SAFETY CONSIDERATIONS

- The competition coordinators and host venues stress the importance of safety practices and procedures to all companies. The score sheets and rubrics will reflect the MATE ROV Competition's efforts to encourage and reward companies that demonstrate exceptional safety practices and procedures.

- **ALL ROVS MUST PASS A SAFETY INSPECTION CONDUCTED BY COMPETITION OFFICIALS PRIOR TO ENTERING THE POOL.** These inspections will be conducted topside to ensure that ROV systems meet the design and building specifications and do not pose a risk to the integrity of the event venue. See VEHICLE DESIGN & BUILDING SPECIFICATIONS for additional information.

  ROV MOTORS MUST BE WATERPROOFED! No exceptions. You may use already waterproofed motors (bilge pump motors, etc.) or you may choose to waterproof small electrical motors.

- Cameras and monitors are permitted but aren't needed as companies are allowed to look into the pool to pilot the ROV. If your company chooses to use a camera(s), the camera(s) and monitor must be powered off of the 12-volt battery or power supply provided by the contest organizers. **NO AC POWER IS PERMITTED WHATSOEVER**. In other words, you can't plug your ROV into a wall socket!

- Radio transmitters that operate on a separate battery are permitted. No batteries are permitted to be in or on the water. No exceptions.

  Companies should be aware of all the implications of these wireless devices. There is no assurance that an adjacent company's wireless controller will not interfere with your control

systems. Adjacent wireless controllers with a battery that has a higher charge than the nearby controller have demonstrated the ability to "hijack" the nearby control signals. In addition, all wireless controllers are susceptible to external sources of electronic interference. Your system may work fine in your home environment, but not in the industrial environment of the competition. MATE will not stop the clock to resolve wireless control issues. Companies deciding to utilize wireless controllers do so at their own risk.

- Safety must also be a priority when operating your ROV poolside. Keep an eye out for tripping hazards in the product demonstration station and at your company's workstation. Make sure power cords are not laying in pools of water on the deck.

- During your product demonstration, be sure to secure any equipment so that it does not fall off the product demonstration station table, damage the deck, or cause injury.

- Loose fitting clothing, jewelry, and long hair could all become safety issues. Consider securing long shirts or baggy pants, removing jewelry, and tying back long hair when working on or operating your ROV.

- ROVs may be constructed out of materials of your company's choice, provided they meet the design and building specifications and safety regulations. Warning labels should be posted on potentially hazardous components of your ROV system.

- Close-toed shoes are required on the pool deck. Safety glasses are required when working on the vehicle.

- Personal flotation devices (PFDs) may be required when launching and recovering your vehicles. Contact your regional coordinator or visit your regional contest's website to determine whether this is a requirement at your regional event. If PFDs are required, they will be provided by the regional coordinator.

PART 4: ENGINEERING & COMMUNICATION

NOTE for 2025!!!

MATE has created an ROV Competition Marketing Kit that includes logos and guidelines for their use.

The ability to communicate information about your vehicle and the design and building process is equally as important as how well your vehicle performs. Strong communication skills are an essential part of good business practices and one of the most in-demand skills in the constantly evolving, ever-changing workplace.

To emphasize this point, the competition requires the following five engineering and communication components:

- Company spec sheet
- Technical (written) documentation.
- Engineering (oral) presentation
- Marketing display.
- Corporate Responsibility (OPTIONAL)

NOTE: Regional contests may not require all of the Engineering & Communication components. Contact your regional coordinator or visit your regional contest's website for more information.

See the TIPS FOR EFFECTIVE WRITTEN AND ORAL COMMUNICATION for additional information.

Notes on the use of AI

The MATE ROV Competition recognizes the expanding use of AI and how it can be used as a tool to overcome challenges, enhance productivity, and fill in knowledge gaps, technical or otherwise, that may occur during the development and build of vehicles and floats. If applicable, how you used AI as a tool (but not as a crutch) to help with your build, increase efficiency, and/or fill in gaps in understanding (but not replace knowledge and skills) should be described within your technical documentation and engineering presentation. It should be understood that you should not use AI to write or prepare your technical documentation or engineering presentation.

NOTE for 2026!!!
Your company should refer directly to the scoring rubrics posted under Scoring for details on what is required for your company spec sheet, technical documentation, engineering presentation, marketing display, and corporate responsibility. The judges will use the rubrics to evaluate and score these engineering and communication components.

5.1 COMPANY SPEC SHEET

The purpose of the company spec sheet is to provide the judges with a "snapshot" of your company. It includes basic information about your company and vehicle.

Company spec sheets will be reviewed by MATE competition coordinators. Companies will receive up to 20 points for submitting a spec sheet that is **one page** in length, follows the file size and naming specifications, and contains **all** of the following information:

COMPANY SPECS

- **Team ID**
- **Company and school, club, or community organization name**
- **Home state and/or country**
- **Distance required to travel to the World Championship**
- **History of MATE ROV competition participation.** Be sure to specify if your company and/or the members of your company are "new" or "returning."
- **Company photo and caption indicating members' names and roles (e.g. CEO, CFO, Design Engineer, Pilot, etc.).** This photo should include all of the members of your company.
- **Range of grade/college levels represented by the members of your company**

ROV SPECS

- **ROV name**
- **Total cost.** You must include the approximate cost of any donated items.
- **Size and weight measurements**
- **Total student-hours to design and build.** This should include the number of hours that each and every member of the company worked on the vehicle.
- **Safety features**
- **Special features**
- **Photo of the vehicle**

REMINDER!!! If all of the above information is included, the specifications for length, size, and naming conventions are followed carefully, and the document is submitted on time, this is an "easy" 20 points! You can find the company spec sheet scoring rubric posted here.

Examples of spec sheets from previous competitions can be found in the MATE ROV Competition Archives.

5.2 TECHNICAL DOCUMENTATION

The purpose of the technical documentation is to challenge you to communicate information using clear and concise text along with graphics, illustrations, and data that add to and complement (and not distract from) the information. Your company must organize and present the information in a way that is logical and complete. The document should focus on the technical and safety aspects of your ROV/ROV systems, the design rationale behind your engineering decisions, and a critical analysis of testing and troubleshooting done on the vehicle. The design rationale should include information on why this design or component is appropriate for this year's theme and mission. You should consider this document a reference for both judges and future team members (part of the company's institutional knowledge).

Your company's technical documentation will be reviewed and evaluated by a panel of upper-class MATE competitors and/or working professionals – individuals who represent science, exploration, government, and industry.

Each judge on the panel will award a score (50 points max). Judges' scores and comments will be returned to you shortly after the event.

NOTE: The judges will not review and rescore revised versions of your technical documentation during the competition.

Use the technical documentation scoring rubric posted here as the guideline for the required components for the technical documentation. This rubric will be posted by March 1, 2026. In the meantime, companies may refer to the previous year's rubrics for a general idea of the categories and points.

Examples of SCOUT technical documentation from previous competitions: Harrington Middle School HMS Seabots (SCOUT 2021) and Northstar Marine Tech, Inc (SCOUT 2016)

5.3 ENGINEERING PRESENTATION

The purpose of the engineering presentation is to challenge you to effectively and efficiently communicate information with words and "props" (i.e., the ROV). Your company must organize and present the information in a way that is logical and covers the development and testing of your ROVs and the formation and development of your team. The presentation should be delivered as a "technical brief." The presentation is THE opportunity your company has to 1) communicate directly and in person your critical thinking, creativity, and engineering reasoning (including build vs.

buy) and 2) demonstrate your individual and collaborative contributions to the creation of the vehicle.

During the competition, your company will have 5-10 minutes to deliver your presentation to a panel of upper-class MATE competitors and/or working professionals – individuals who represent colleges and universities, science, exploration, government, and industry. After the presentation, the judges will take up to 5-10 minutes to ask the members of your company questions about your ROV. The judges will evaluate both your presentation and responses to their questions. Each judge on the panel will award a score (50 points max). Judges' scores and comments will be returned to you shortly after the event.

All student members of your company must be prepared to participate in this presentation and the question and answer (Q&A) period. You are required to have your ROV with you, but will not be allowed to power up. During the Q&A, all members of the company should be prepared to answer. However, if one student is better able to answer a specific question, the others may pass the question to that student to answer. For example, if a judge calls on the pilot to answer a question about the tether, the pilot can respond by informing the judge that the tether manager was the lead on that system and allow the tether manager to answer without penalty or loss of points.

NOTE: The engineering presentation is designed to be a face-to-face interaction where students and representatives from industry become engaged in conversation. MATE will not provide audio visual aids, such as slide projectors, computer projection screens, white boards, etc.; however, you are welcome to distribute handouts to help judges better understand the information that you are presenting. Electronic forms of presentation (e.g. PowerPoint or Keynote slides) **are NOT permitted.**

Note for 2026!!!

Companies are permitted to bring a maximum of **two** videos, each no more than 30 seconds long, to demonstrate a design or component that cannot easily be demonstrated without powering the ROV. These videos **cannot** be pre-recorded portions of the presentation; while they may show a design or complex component in action, they should not include an explanation of that design or component. The company is expected to provide any electronic device needed to present these videos; MATE will not provide a device or access to a projector. Note that the time taken to present these videos is part of your allotted time.

Instructors, mentors, family members, friends, and members of other companies are permitted to attend. However, we ask that those in attendance be respectful and courteous throughout the presentation and follow-up question and answer period. Be mindful that this presentation may be a stressful time for the students. If the room becomes crowded or the spectators become distracting, it is up to the judges' discretion to request that some or all spectators leave the presentation. **While they are permitted to attend, instructors and mentors are not allowed to participate.**

Use the engineering presentation scoring rubric posted here as the guideline for the required components for the engineering presentation. This rubric will be posted by March 1, 2025. In the meantime, companies may refer to the previous year's rubrics for a general idea of the categories and points. Judges may ask questions regarding any of these topics not covered in the presentation as well as other questions about the vehicle, the mission theme, or the company.

Preparing for your engineering presentation and Q&A

- Make sure that every member of your company has a good, general working knowledge of your vehicle, even though they may have specialized in one specific aspect of its design and construction.
- Encourage each member of your company to keep a project notebook. Before the competition, set up a time where you compare notebooks. One member might have written more information about your ROV's electrical system, while another might have included details about buoyancy that others forgot. This exercise will help to refresh everyone's memory about the design and building process. If your company submitted technical documentation, make sure that all company members have read and are familiar with it. This exercise will help to familiarize everyone with all aspects of the project.
- Generally, you will have more to say about your ROV than can be presented in 5-10 minutes. That is why it is critical to organize your material and practice communicating it. However, avoid coming across as having memorized your presentation verbatim. Judges want to see that you are prepared and understand the information, not that you can simply regurgitate a rehearsed speech from memory. Ask your instructors or mentors to give you feedback.

Other important items

- If during the engineering presentation it becomes apparent that instructors, mentors, and other adults associated with your company exercised more than an advisory role, judges reserve the right to deduct points or, in extreme cases, disqualify companies.

Videos of engineering presentations can be found on the MATE Vimeo site: Hawks Engineering (RANGER 2021). This is RANGER presentation (higher level, 15 minutes not 10 minutes) but is a good example of a presentation.

5.4 MARKETING DISPLAY

The purpose of the marketing display is to challenge you to present technical information in a way that appeals to and is understood by a non-technical audience. It is the promotional piece – you must not only present information about your ROV and your company, but you must also use graphics and design to publicize and "sell" (convince viewers, including the general public, of their value and excellence) your products and people.

During the competition, your company's display will be evaluated and scored by a completely different group of working professionals – individuals who will represent science, business, government, industry, and education/outreach.

While some judges will have a technical background, others will have a communications, marketing, or public relations background. In addition, there will be visitors to the competition who may not completely understand what an ROV is or how it is used. Think of these visitors as potential future clients who may authorize funding for your work but have a limited understanding of the technology (i.e., you need to explain your technology, the tasks at hand, and "sell" them on YOUR products and services). Design your display to communicate to this type of audience.

Each judge will award a score (50 points max). Judges' scores and comments will be returned to you shortly after the event.

Each company will have a space approximately 3-feet x 3-feet for its display. Depending on your regional, tables may or may not be provided. Contact your regional coordinator or visit your regional contest's website for more information.

Use the marketing display scoring rubric posted here as the guideline for the required components for the marketing display. This rubric will be posted by March 1, 2025. In the meantime, companies may refer to the previous year's rubrics for a general idea of the categories and points.

Creating an effective marketing display:

- Address the overall theme and make real-world connections (how could your company and ROV solve these real-world problems?).
- Address the UN Sustainable Development Goals and ESG.
- Reflect your company's personality and mindset.
- Make key points and be concise.
- Keep the general public in mind.
- Make sure to label any and all figures, graphs, diagrams, and photographs and credit the source.
- Maximize the use of the 36" by 48" display space.
- Make sure that it is both informational and aesthetically pleasing.

Note: "Accessories" such as video footage, PowerPoint slide presentations running on laptop computers, video projections, etc. are permitted but should be used with discretion. Remember that the judges will have a limited amount of time to evaluate your marketing display and may find excessive use of audio or video presentations distracting.

However, if you do make a video of your ROV building or competition experience, please submit information about it to the MATE ROV Competition officials so that it can be shared via MATE's YouTube and Vimeo channels.

Examples of SCOUT marketing displays from previous competitions: Glacier High School – Betta (SCOUT 2023) and Aptos Jr. High School – Circuit Breakers (SCOUT 2023).
Examples of top marketing displays from the 2025 World Championship competition: Jesuit High Poster (EXPLORER), Miramar Poster (PIONEER), Coral Crusader Poster (RANGER.)

5.5 CORPORATE RESPONSIBILITY

The MATE ROV Competition uses underwater robotics to inspire and encourage students' interest in STEM (science, technology, engineering, and math) education and careers. Recognizing that the students who participate in MATE competitions are powerful ambassadors for the program as well as effective leaders in raising awareness of important issues and bringing about positive change, companies have the opportunity to earn up to 20 points for "corporate responsibility."

Corporate responsibility includes, but is not limited to, the following:

- **Education focused initiatives** consists of, for example, providing guidance to other students in your area who are designing and building an ROV for the competition or a science or other project.

  This follows the industry trends of engaging in educational partnerships and STEM outreach to students. Specific examples of education-focused initiatives include:
  - Mentor newer/less experienced MATE ROV Competition teams
  - Support local schools/organizations
  - One-time / short-term educational activities
    - MATE regional competition volunteer
    - Science fair judging
  - Structured presentations or exhibits that specifically showcase marine technology
    - Career day presentation/talk

  Education-focused initiatives will be scored on the number of events, with continual interactions preferred over one-time events, and the reporting of measurable impacts on the participants of the initiatives. Measurable impacts include how many students were mentored, whether mentored students participated at a regional competition or other event, etc.

- **Engaging the community** includes demonstrating your ROV and sharing information about your company at festivities and other community-wide events. Presenting to a Rotary Club or your school district's board of directors are examples.

  This follows the industry trends of participating in STEM outreach to the community and media engagement. Specific examples of engaging the community include:

    - One time / short-term outreach activities such as a STEM activity booth at community events
    - Media engagement
        - Press release distribution
        - Media coverage secured

  Engaging the community will be scored on the number of events participated and the reporting of measurable impacts. Measurable impacts include how many people visited a booth or the amount of media coverage that resulted.

- **Environmental Impact** consists of conducting citizen science, environmental monitoring and organizing or participating in environmental cleanup activities.

  This follows the industry trends of focusing on environmental monitoring and ocean conservation, and the growing trend of citizen science. Specific examples of environmental impact outreach include:
    - Scientific data collection and monitoring projects
        - Water quality monitoring
        - Marine habitat assessment
    - Organize/participate in beach, waterway or environmental cleanups

  Environmental impact outreach will be scored on the number of events. Scientific data collection projects will emphasize an ongoing long-term data collection project with regular data collection and proper calibration of instruments. Public sharing of data will be emphasized as well. Environmental cleanup events will be scored on the number of events, with an emphasis on teams organizing over participating in an event. Additional emphasis will be placed on properly disposing of waste and of proper safety protocols being followed.

- **Knowledge sharing** consists of providing open-source data on your vehicles code and design specifications and engaging social media to follow your company's journey to the competition.
  This follows the industry trends of emphasizing open access to data and technology.
  Specific examples of knowledge sharing include:
    - Publishing document code on GitHub/GitLab/other public source
    - Technical resource creation, including tutorial videos and technical blog posts
    - Maintaining an active project website/blog
    - Social media engagement and video documentation
        - Regular updates on company progress
        - Educational content sharing
        - Industry/STEM news sharing
        - Project development videos

  Knowledge sharing will be scored on the number of activities, with emphasis on open-source documentation links, and activities being tagged as MATE ROV Competition.

Here are some general guidelines for working with the media. They are specific to the World Championship but can be easily modified for regional events.

Corporate responsibility efforts will be reviewed by competition coordinators and awarded 0 to 20 bonus points, depending on the number and scope of the outreach and awareness activity(s), i.e., the number of other students or members of the community engaged, the number of mentoring sessions, etc.

Make sure to include the following information in your write up:

- Type of activity (e.g. education-focused activity, engaging the community, environmental impact, knowledge sharing.)
- Locations, dates, and the amount of time spent on the activity.
- Number of students or community members (if a large event, this can be an approximate) involved.
- Description of your actions, outcomes, and other information that helps to demonstrate the quality of your time and efforts. Emphasis will be placed on the impacts and outcomes of the event.
- For media outreach, please submit a copy of your press release, a copy of your media contacts list, and a summary of news articles, TV or radio coverage, etc. that your company received. Include copies of articles and URLs, and list any television or radio coverage. Be sure to include name of outlet, date, and a summary of the coverage.

New for 2026!!!

MATE is emphasizing a deeper dive into two (or three) of the Corporate Responsibility categories instead of requiring companies to cover activities in all four categories. See the scoring rubric for additional information.

Use the Corporate Responsibility scoring rubric posted here as the guideline for your Corporate Responsibility submission. This rubric will be posted by March 1, 2026. In the meantime, companies may refer to the previous year's rubrics for a general idea of the categories.

TIPS FOR EFFECTIVE WRITTEN AND ORAL COMMUNICATION

Communicating ideas about how to solve a problem and evaluating those ideas against competing alternatives is a critical skill for anyone entering the workplace. It is a skill that is directly linked to decision making about whether or not to hire (or fund) us and our ability to influence the work that we do.

The key to a successful technical documentation and engineering presentation is the way that critical thinking and engineering reasoning are communicated. You can think of the process as technical "storytelling."

Technical storytelling includes the use of text, images, schematics, and data to effectively communicate the “story” of how your company brainstormed and evaluated ideas to come up with your solution (e.g. ROV, payload tools, and operational strategies) to the problem at hand (product demonstration tasks). It also involves organizing content to efficiently present your work and justify why you did what you did.

However, you should choose details with care. Each detail should help to answer the question "why is what you did the best solution for your company and for this competition?" Describe why a component in the system is critical and how you chose it. Include specifications or dimensions only if they help to explain the “why” and “how” you made choices. Keep in mind that a mechanical drawing with dimensions can replace a lot of text and in many cases do a better job telling details of the story than text.

That said, if something is hard to describe clearly and completely with two to three sentences, consider whether using an image may help. A good technical document balances text and images to provide lots of information concisely, which for a detailed understanding while being quick and easy to read. Remember that your reader is new to your design and needs to understand both what your design is and the process you used to get there. Present text and images in a logical order that helps readers follow your development process and results.

Maintaining a project notebook is a good business practice that will help to capture ideas and document your company’s progress – including your research, designs, trade studies, experiments, data, vehicle specifications, testing, expenditures, and donations. The notebook is also a place to keep track of your company member’s contributions (time, support, etc.).

Along with your notebook, here are some items to consider as you prepare to tell your story:

- What was your company’s "work breakdown structure" (tasks, time, and people)?
- What were the greatest constraints (schedule, budget, equipment, labor, logistics, etc.) on your design process?
- How did the product demonstration tasks and rules influence your design and decisions?
- What process did you use to evaluate different design solutions?
- What were the most important design decisions you made and why?
- How did you arrive at your final power budget? What concessions, if any, did you have to make and why?
- How do you calibrate your sensors?
- If your vehicle uses software, where does the code execute? Describe the flow and format of the data.
- Did you have a noteworthy troubleshooting experience? Any problem or procedure that takes more than 20 minutes to figure out is worth understanding and writing down.
- How did the mission theme influence your choices across the ROV? What choices would have big impacts had this been in a less controlled environment?

Note for 2026!!!

The Engineering & Communications components are 45% of a company's overall score. Working on these components early and preparing thoroughly (practicing your engineering presentation, proofreading your technical documentation and marketing display) can increase your chances of achieving a higher score.

PART 5: DOCUMENTATION

Companies are required to submit a system interconnection diagram (SID) of their vehicle control system. Your regional may also require you to submit technical documentation and a company spec sheet, and Corporate Responsibility may be optional.

Contact your regional coordinator or visit your regional contest's website to determine what documentation must be submitted and what documentation is optional for your regional and the date the documentation is due.

DOC-002: Technical documentation: A technical document or engineering notebook about your vehicle that will be reviewed by a panel of judges. See the technical documentation section for more information on the contents required for the technical documentation.

DOC-003: Company spec sheet: A one-page document that provides a snapshot of your company and ROV. See the company spec sheet section for more information on the requirement for the company spec sheet.

DOC-004: SID Electrical: Companies must provide a system interconnection diagram (SID) of their vehicle control system during their safety inspection.

DOC-005: Fluid power SID: Companies using fluid power (hydraulics or pneumatics) must provide a fluid power diagram. The diagram should separate and show what systems are on the surface and what systems are on the vehicle. A fluid power SID for simple syringe hydraulics would consist of a syringe box on the surface connecting to a syringe box on the vehicle.

The fluid power SID can be incorporated into the Electrical SID or can be a separate, one page document.

DOC-006: Documents may be due before the competition or the day of the competition. Regardless, companies MUST bring a SID of their ROV systems in order to pass the safety inspection!

NOTE: By submitting your documentation, you are giving the MATE ROV Competition permission to publish these documents on its website and in other, competition-related media.

6.2 KEY DEADLINES

Contact your regional coordinator or visit your contest's website to determine the key deadlines for your regional competition.